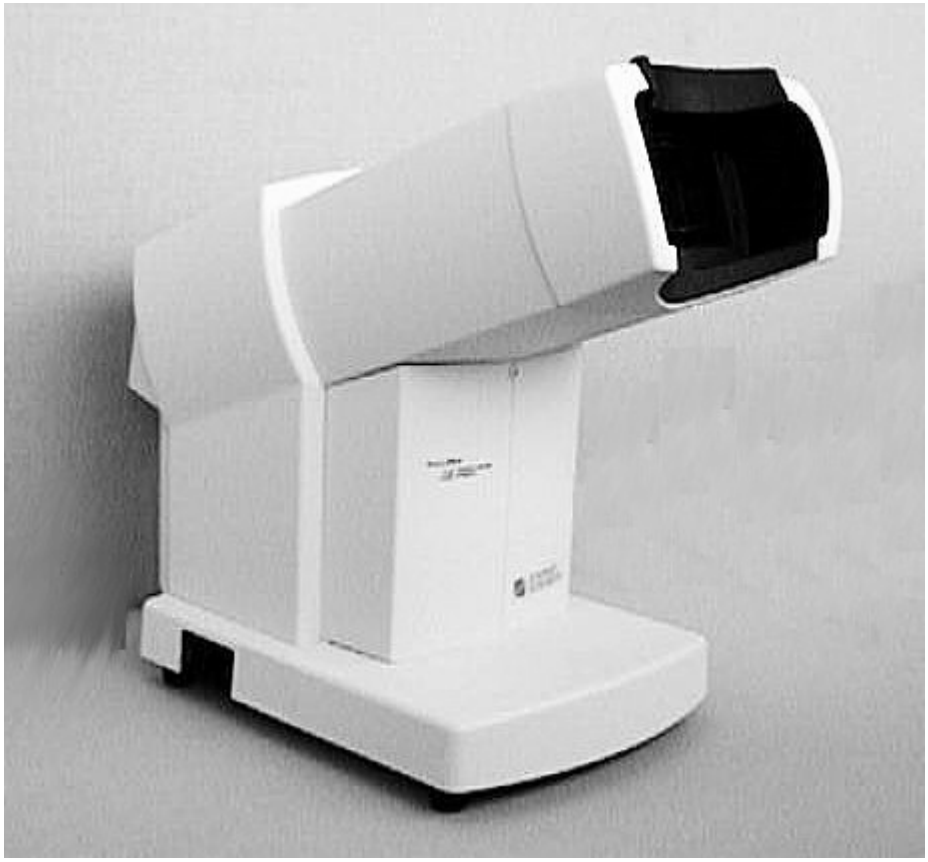
Eye Care Menu

Operator Manual

Note: Drawings and Schematics are not available in this revision.

HUMPHREY

FDT Visual Field Instrument



SERVICE MANUAL

Includes CE Model

HUMPHREY INSTRUMENTS
A Division of Carl Zeiss, Inc.

WelchAllyn™
FREQUENCY DOUBLING TECHNOLOGY

Part Number 112120
Revision B October 1997

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Part No	Rev	Description	ECN #	Date	Approved
112120	A	New Release of FDT Service Manual	5-36180	8/22/97	RJS
112120	B	Added CE version Section 9 , Calibration Limits and Error Messages.	5-36574	10/21/97	RJS

DRAWINGS AND / OR ILLUSTRATIONS AND / OR PART NUMBERS CONTAINED IN THIS DOCUMENT ARE FOR REFERENCE PURPOSES ONLY! FOR CURRENT REVISIONS CALL HUMPHREY INSTRUMENTS CUSTOMER SERVICE

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About The 710 Series FDT Visual Field Instrument

The **710 Series** FDT Visual Field Instrument utilizes **Frequency Doubling Technology (FDT).** Various preprogrammed patterns of flickering black and white vertical bars are presented to the patient on a video screen. Each patient is tested on the degree of contrast between the black and white bars which enables them to see each pattern.

The Frequency Doubling stimulus taps into a select subset of retinal ganglion cells that have been observed to die in early glaucoma patients. Because the stimulus is selective only to this subset of cells, the test is accurate and rapid.

Help Information:

All service and repairs must be performed by authorized Humphrey Instruments personnel or agents, using genuine replacement parts. Failure to do so will invalidate the product warranty.

Read and understand all safety warnings and service notes printed in this Service Manual and the User,s Guide. If in doubt about any precaution or procedure, call Humphrey Instruments Customer Service phone number below.

For Phone Help, call Humphrey Instruments Customer Service at: **800-341-6968**

The part and serial numbers are located on the bottom of the unit.

Troubleshooting assistance is contained in Section 3 of this manual. Troubleshooting is limited to board level replacement and not board component replacement.

Please read and understand FDT User's Guide #112098, a copy of which may be obtained by calling Humphrey Instruments Customer Service Department at the toll free 800 number above.

Read Important Safety Information in User's Guide.

EXERCISE EXTREME CAUTION WHEN SERVICING THE FDT! THE MONITOR ASSEMBLY OPERATES ON APPROXIMATELY 10,000 VOLTS!

Do not remove the plug from the end of the CRT exposing sharp glass process tube. This can cause cuts! (Photo 1 at right.)

Disconnect FDT from Mains when disassembling.

Clean as recommended in Users Guide.

Follow ESD precautions during service.

Test repaired FDT units at 115v and 230v prior to returning them to customers.

Support the FDT by holding under the base to protect the upper optics section from stress.

Please DO NOT adjust pots on the monitor board. The video monitor is a non-standard design and because of this, there are no field monitor or video service adjustments. Video adjustments can only be performed by the monitor manufacturer with special equipment. **Unauthorized adjustments may result in clinically invalid results without obvious indications of any malfunction.** (Photo 2 at right)

Tighten fasteners carefully. Refer to drawing #112000 in this manual for recommended fastener torque specifications.

Put a calibration cap (see bubble number 90 on drawing 112000) on the optics tube assembly during servicing to protect optics tube window.

The RS232 connector housing of the MCU PCB projects below the bottom of the MCU PCB (Photo 3 at right). Do not stand the chassis monitor assembly on this connector. Put the chassis monitor assembly on its back between repair steps.

Always install latest revision software when installing a new MCU/PCB. Call Humphrey Customer Service. See Section 2 Pg. 4 for details.

Important Safety Warnings and Service Notes

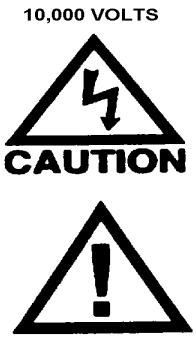
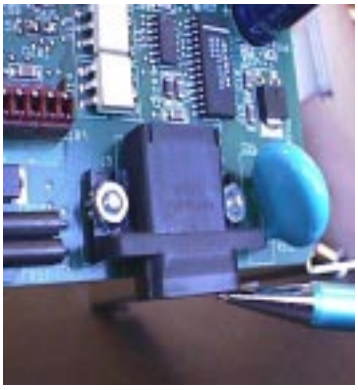


Photo 1

Photo 2

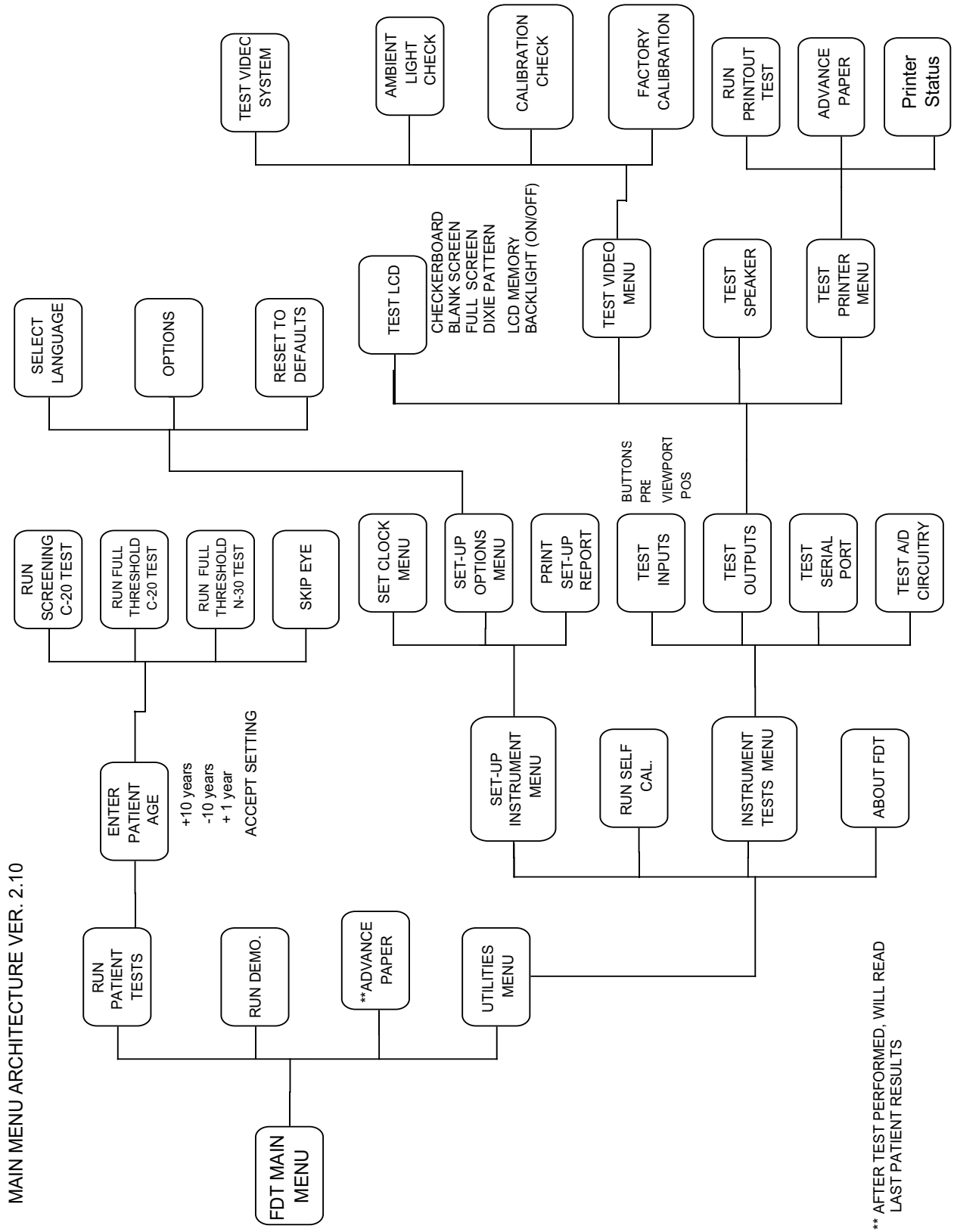
Photo 3



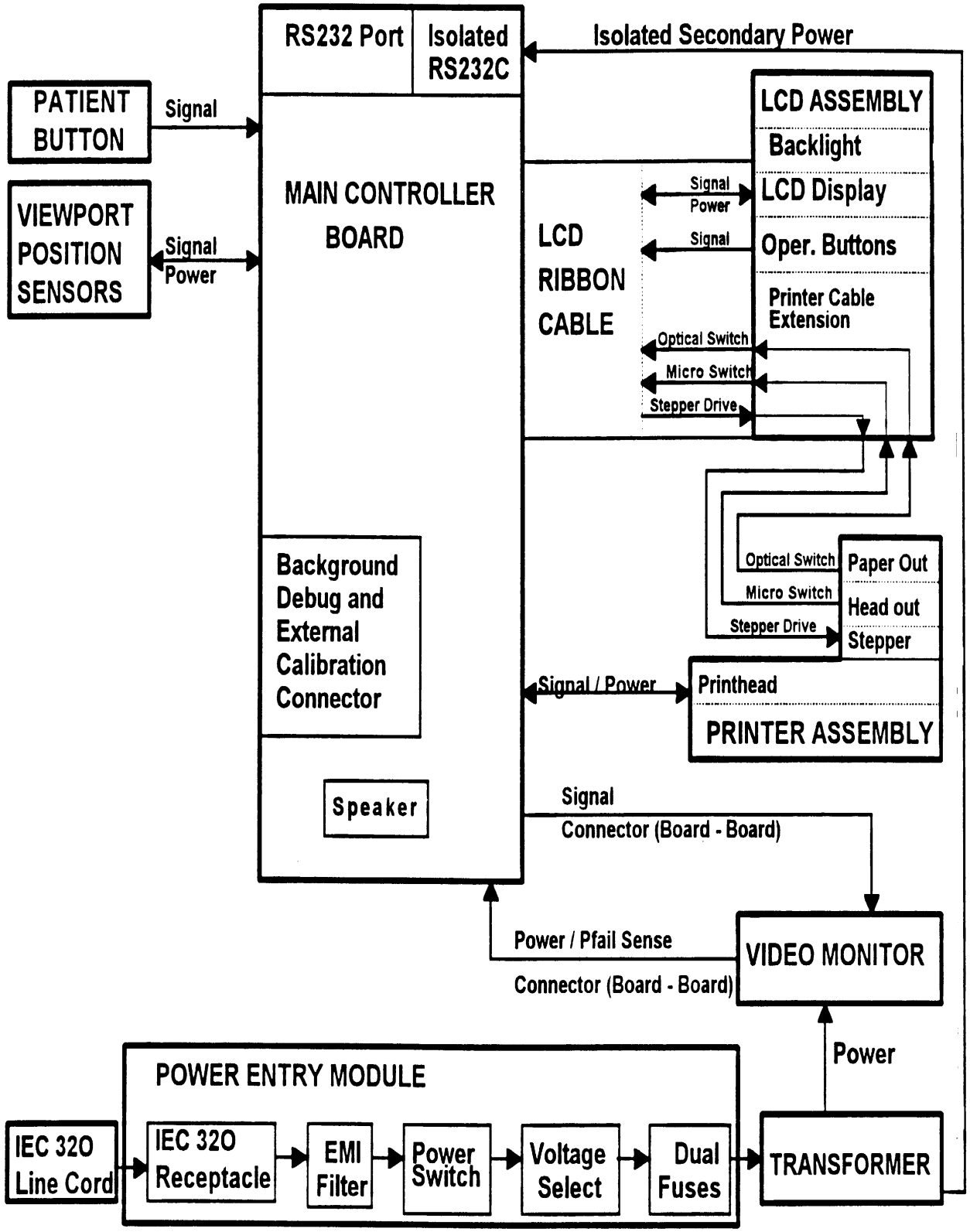
Important Safety Warnings and Service Notes

Photo 4

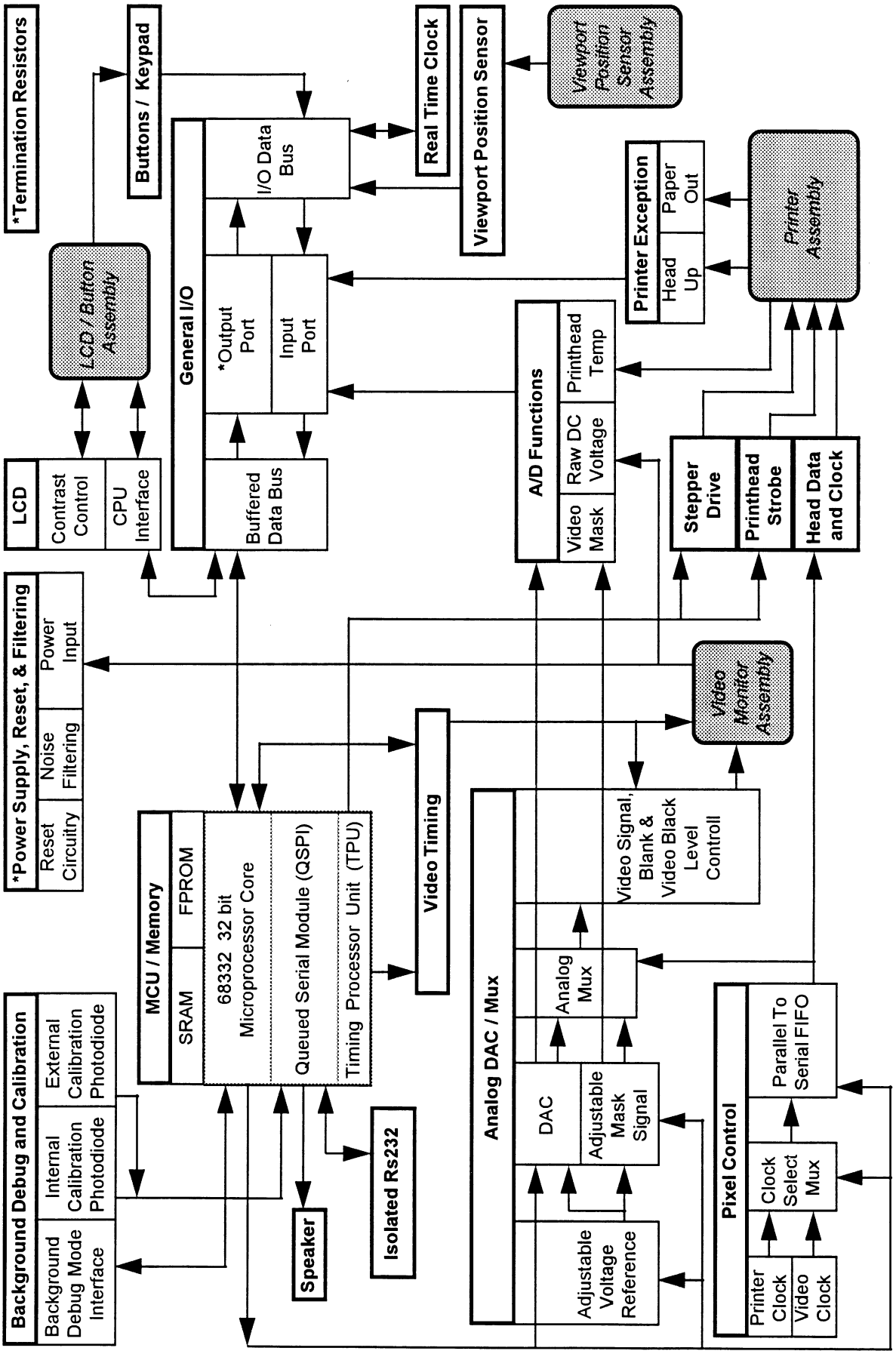
Copper ESD shields may have sharp edges.
Exercise caution to avoid cuts!


MAIN MENU ARCHITECTURE VER. 2.10
FDT MAIN MENU
RUN PATIENT TESTS
RUN DEMO.
**ADVANCE PAPER
UTILITIES MENU
ENTER PATIENT AGE
+10 years
-10 years
+ 1 year
ACCEPT SETTING
RUN SCREENING C-20 TEST
RUN FULL THRESHOLD C-20 TEST
RUN FULL THRESHOLD N-30 TEST
SKIP EYE
SET-UP INSTRUMENT MENU
RUN SELF CAL.
INSTRUMENT TESTS MENU
ABOUT FDT
SET CLOCK MENU
SET-UP OPTIONS MENU
PRINT SET-UP REPORT
TEST INPUTS
BUTTONS
PRE
VIEWPORT
POS
TEST OUTPUTS
TEST SERIAL PORT
TEST A/D CIRCUITRY
SELECT LANGUAGE
OPTIONS
RESET TO DEFAULTS
TEST LCD
CHECKERBOARD
BLANK SCREEN
FULL SCREEN
DIXIE PATTERN
LCD MEMORY
BACKLIGHT (ON/OFF)
TEST VIDEO MENU
TEST SPEAKER
TEST PRINTER MENU
TEST VIDEO SYSTEM
AMBIENT LIGHT CHECK
CALIBRATION CHECK
FACTORY CALIBRATION
RUN PRINTOUT TEST
ADVANCE PAPER
Printer Status
** AFTER TEST PERFORMED, WILL READ LAST PATIENT RESULTS

Hardware System Wiring



System Function Electrical Architecture



Incoming Inspection

When an FDT unit is returned, check:

1) Physical condition of packaging.

2) Physical condition of unit.

3) List any accessories with unit, for example:
   power cord
   Patient Response Button (PRB)
   calibration cap
   dust cover
   computer interface cable

4) Perform “PRINT SET-UP REPORT” if possible, and keep for reference.

5) Perform Cleaning/Disinfection per instuctions in User’s Guide, Section 4, Maintenance.

Tools Required for Service Factory Calibration and Software Uploading

#1 Flathead screwdriver - 2” length
#1 Phillips screwdriver - 4” length
#2 Philips screwdriver - 4” length
1/4” drive ratchet with 1/4” extender
11/32” socket
3/32” hex key
7/64” hex key
Adjustable torque driver - 2 - 14 in/lbs range
Bits for Torque Driver:
#1 Phillips
#2 Phillips
3/32” hex
7/64” hex
1/4” square to hex adapter
Torque Wrench - Adjustable 2 - 14 in/lbs range
Torque Handle: Mountz 06-8002 TB1H 12-21 in/lb or equivalent.
Torque Handle Box Wrench accessory:
Mountz 068127 Box Head - 11/32”

T15145 - for PRB connector
T15104 - Calibrator and Software Floppy Disc
(see Photo 1 at left)

T15810- Serial Port Tester
(can be made with a standard DB 9 female with these connections: Pins 1,4,6,9 common
Pins 2,3 common
Pins 6,8 common
Digital volt meter (three plus range)
Needle nose pliers

Photo 1

Photo 1b

Photo 2

Upgrade recommendation: **Upgrade all returned FDT,s with Software Version 2.10. Perform Factory Calibration Process.**

Start Factory Calibration Process:

1 Turn FDT unit **OFF**.

2 Connect the wire from the T-15102 Factory Calibrator to connector board as shown in Photo 3. Wires must exit from top of connector as shown.

3 Remove Visor/Browrest (Sect 4 or 9 for CE FDT)

4 Tilt FDT on its side to remove label over Calibration/ Software loading port J2.

5 Align threaded studs of connector board with the two holes near port J2 as shown in Photo 4.

6 Insert T 15102 into port J2 as shown in Photo 5. Hookup should be as shown in Figure 1 below.

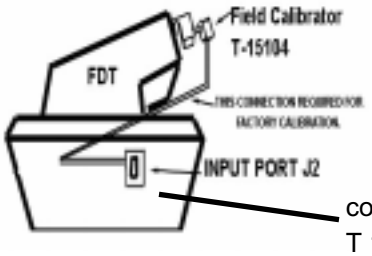


Fig. 1

7 Position the FDT in upright position and place calibrator onto the slide bracket . See Photo 6

Note: Place calibrator on viewport tightly to prevent light from entering the calibrator housing.

8 Turn the FDT ON and view the menu on the LCD:
a) Press button next to **UTILITIES MENU**
b) Press button next to **INSTRUMENT TEST MENU**
c) Press button next to **TEST OUTPUTS**
d) Press button next to **TEST VIDEO MENU**
e) Press button next to **FACTORY CALIBRATION**

NOTE: Unit can be calibrated with PC utility Calibrat through the FDT computer interface. Refer to the Calibrate utility for more information.

9 Press any button to indicate that you have placed the factory calibrator on the view port.

Factory Calibration for Software Version. 1.20 or higher

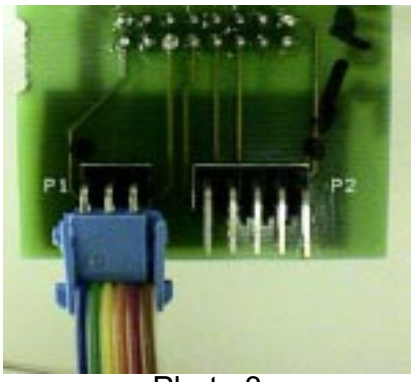


Photo 3

Photo 4

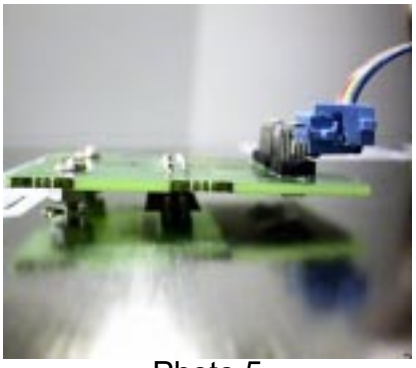


Photo 5

Photo 6

Factory Calibration for Software Version. 1.20 or higher (continued)

10 Press any button to start the Factory Calibration calibration process. Duration : less than 1minute.

NOTE: Self-Calibrate is automatically performed during Factory Calibration in Version 2.10

11 Turn the FDT **OFF** and remove calibrator from slide bracket.

12 Remove T-15102 connector board from Port J2 on bottom of FDT. Install a new label part # 112066 over J2 port.

13 Turn FDT ON and view the menu on the FDT LCD:
- a) Press the green button until the **UTILITIES Menu** is reached.
- b) Put the black calibration cap on the viewport.
- c) Press the button next to **RUN SELF CALIBRATION.** (Process time: 2 - 3 min.)

Note: A progress indicator will display on the LCD. It will indicate what percentage of the calibration is complete. The unit will indicate when calibration is complete and return to **UTILITIES MENU.**

14 Now perform a *Calibration check*:
- a) Press button next to **INSTRUMENT TEST MENU.**
- b) Press button next to **TEST OUTPUTS**
- c) Press button next to **TEST VIDEO MENU**
- d) Press button next to **CALIBRATION CHECK**

Note: The meter will indicate that the FDT is fully calibrated.

15 Press any button to continue.

16 Press the green button 4 times or until **FDT MAIN MENU** is reached.

17 Install the visor/browrest with the 4 black hex socket head cap screws as shown in Section 4.

Note: See Calibration Limits/Parameters Tables in this section.

(End of Factory Calibration Process)

Start Software Loading Process:

1 Connect the ribbon cable to the ICD Cable connector as shown in Photo 7 at right.

Note: a) 2 Pins at right are not used
b) Align the red wire of the ribbon cable with the red arrow on ICD connector.

2 Connect the ribbon cable to the connector board as shown in Photo 8.

3 Connect ICD connector to the PC Parallel Port . See Figure 2 below.

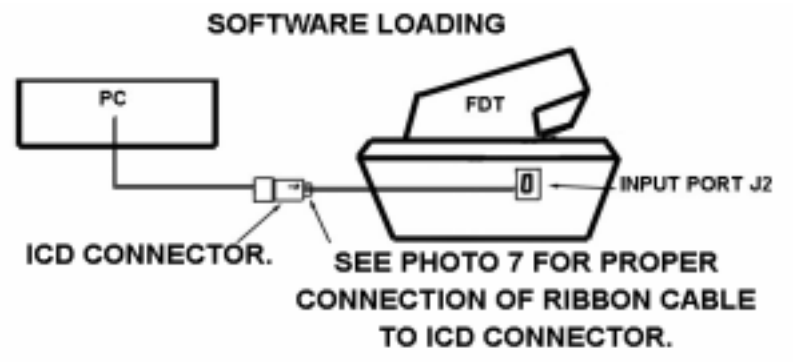


Figure 2

4 Insert T 15102 into port J2 as shown in Photo 5 and follow software loading instructions displayed on the PC when running FDT Software Installation Program.

Note: Whenever installing a new MCU/PCB and loading highest revision software, verify proper hardware (marked on MCU/PCB) version using "ABOUT FDT". LCD Screen will display software/hardware data. See Photo 9

Software Version:	**Release Date:**
Ver. 1.20	July 1997
Ver. 2.10	October 1997

Hardware Version:	**Release Date:**
MCU/PCB Rev 503	August 1997
MCU/PCB Rev 504	September 1997

Note: See Product Updates in this section.

Loading Software for FDT

Note: FDT software is not Mac compatible.

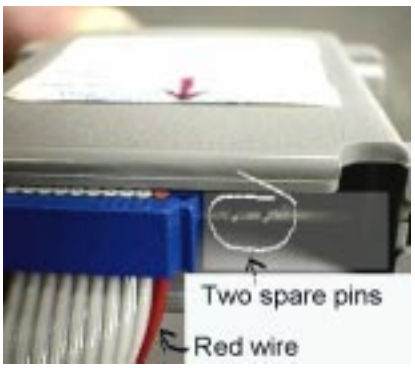


Photo 7

Photo 8

Photo 9 FDT LCD Screen

Final Testing (page 1 of 6)

Note: Follow this final testing process to verify correct operation after the FDT has been serviced.

1. Calibration

Follow instructions in the calibration section of manual.

2. 230 Volt testing

Remove fuse block. Replace the 115v fuses (.315A) with those recommended for 230v.(.160A)
Place fuse block back into unit so the 230v shows. Plug unit into a 230v line and turn unit on. After approximately 10-15 seconds the unit should go through a series of beeps and the FDT Main menu should appear. After this test is done, turn off unit, remove power and replace the fuses with the 115V (.315A) ones. Be sure that the115V shows in the fuse drawer.

3. Operational testing

3.1 Plug in PRB.

3.2 Turn unit on. After approximately 10-15 seconds the unit will complete self diagnostics and emit two double beeps. The FDT main menu will appear.

3.3 Press the button next to **UTILITIES MENU**.

3.3.1 Check the intensity adjustment.

a) Press the button pointing downward. The LCD contrast will decrease.

b) Press the button pointing upward. The LCD contrast will increase.

c) Use both buttons as needed to return to usable LCD contrast.

3.3.2 Press the button next to **ABOUT FDT.** The screen will indicate that the unit is fully calibrated and show the software revision. Make sure that it has the latest revision software.

3.3.3 Press the green button on the bottom left. This should bring you back to the **UTILITIES MENU.**

3.4 Press the button to the left of **INSTRUMENT TESTS MENU**.

3.4.1 Press the button next to **TEST INPUTS.**

a) Press each of the 4 upper left buttons. When each buttons is pressed, the word **PRESS** to the right of the button will change to a **PRESSED** highlighted. Release the button. **PRESS** will reappear unhighlighted.

b) Move the visor to the three different positions - left, middle and right (patients side). The **Eye test position** on the right hand side of the display will change state to indicate the current eye test position.

c) The **Patient button** will indicate **NOT PRESSED**. Press the PRB and it will report a highlighted **PRESSED**.

d) Unplug the PRB plug from the PRB jack. The Patient Button status will indicate: Not connected. Plug the PRB plug into the PRB jack.

3.4.2 Press the green button on the bottom left to return to **INSTRUMENT TESTS MENU**.

Final Testing (page 3 of 6)

3.5 Press the button next to **TEST OUTPUTS**.

3.5.1 Press the button next to **TEST LCD**.

a) Observe highlighted test option on screen.

b) Press button next to **RUN TEST**. The LCD will reflect state of the highlighted test option.

c) Press any button to exit present LCD test.

d) Press button next to **NEXT CHOICE** to change test option.

e) Perform the above steps for the **CHECKERBOARD, BLANK SCREEN, FULL SCREEN, AND DIXIE PATTERN** options.

f) Press button next to **NEXT CHOICE** to highlight **LCD MEMORY TEST.**

g) Press button next to **RUN TEST.** The display will be; **Testing LCD memory** and change to **LCD memory passed**. Press any button to exit test.

h) Press button next to **NEXT CHOICE** to highlight the **BACKLIGHT** option.

i) Press button next to **RUN TEST** a number of times and observe the LCD screen. The backlight should toggle on and off. Make sure the Backlight is on before exiting this test.

j) Press the green button to return to **OUTPUT TESTS**.

Final Testing (page 4 of 6)

3.5.2 Press the button next to **TEST VIDEO MENU.**

a) Press the button next to **TEST VIDEO SYSTEM**.

b) Look into the patient viewing area. A large flashing circle exhibiting the Model 710 Series grating pattern in the center of the viewing area will be visible.

c) Press the Green button to return to **TEST VIDEO MENU**.

3.5.3 Press the button next to **AMBIENT LIGHT CHECK.**

a) There may be a short time for monitor warm up.

b) With the calibration cap on, the pointer will be in the dark range.

c) Remove the calibration cap. The pointer will rise to the light or bright range, depending upon the intensity of the room lighting.

d) Put the calibration cap back on and press the green button to return to **TEST VIDEO MENU**.

3.5.4 Put Calibration cap on. Press button next to **CALIBRATION CHECK.**

NOTE: Calibration will be denied if cap is off and room light level is too high.

a) The pointer should be in the fully calibrated range.

b) **Do not press the factory calibration option**. **If this option is accidentally chosen, the unit will detect that a calibrator is not attached and warn user**.

c) Press the green button twice to return to **OUTPUT TESTS MENU.**

Final Testing
(page 5 of 6)

3.6 Press the button next to **TEST SPEAKER.**

3.6.1 There will be increasing tones.

3.7 Press the button next to **TEST PRINTER MENU.**

3.7.1 The **TEST PRINTER MENU** will be displayed. Press the button next to **RUN PRINTOUT TEST.** The FDT will print out a series of patterns and instrument data.

3.7.2 Press the button next to **ADVANCE PAPER**. The paper will advance about 1-2 inches beyond the slot in the paper door.

3.7.3 Press the button next to **PRINTER STATUS. "PRINTER OK"** message will appear.

3.7.4 Press the green button 3 times to return to **INSTRUMENT TESTS MENU.**

3.8 Press the button next to **TEST SERIAL PORT**.

3.8.1 Press any of top four buttons to execute test.

3.8.2 Both the data transfer and hand shaking test should fail.

3.8.3 Press the green button to return to **INSTRUMENT TESTS MENU**.

3.8.4 Place T-15810 into the serial port on bottom of unit. See Photo 10.

3.8.5 Press the button next to **TEST SERIAL PORT**.

a) Press any of top four buttons to execute tests.

b) LCD will display:
DATA TRANFER PASSED
HANDSHAKING PASSED

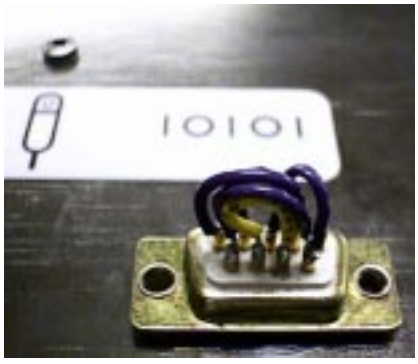


Photo 10

Final Testing (Page 6 jof 6)

3.8.6 Press the green button twice to return to **INSTRUMENT TESTS MENU.**

3.8.7 Remove T-15810.

3.9 Press the button next to **A/D CIRCUITRY**.

3.9.1 A reading will come up for Mean gray and printhead temperature. If the unit fails this test a malfunction error will appear**.**

3.10 Perform a screening test to check unit operation.

3.11 Turn unit off.

Hypot, Ground Continuity, and Leakage Current Testing

(For In-House use only.)

4. Agency testing

4.1 Hypot

Testing at 1500VAC for one second. Apply the voltage between primary wiring (supply terminals connected together) and accessible dead metal parts without breakdown indication.

4.2 Ground continuity

Total resistance of the product shall not exceed 0.2 ohms (2.0VDC). The test will be conducted using a 10 amp DC current source with a no load voltage no greater than 6.0VDC for five seconds. Measure ment will be taken from the grounding pin of the power supply cord to the accessible metal part of the product.

4.3 Leakage current

The leakage current measured from any exposed grounded metal parts to the grounding pin of the power supply cord shall not exceed 100 microamps, AC RMS (95.5MVAC RMS) with input voltage set to 120VAC, 60HZ or 240VAC, 50HZ.

If a FTD fails any test in this section, set it aside for troubleshooting and repair. When the FDT is repaired and passes all the tests, place a label over the calibration port.

Important Shipping Information

Paper roll foam prevents un-winding during shipping

Note: **Install a new roll of paper.**

Install the paper roll foam before packing the unit for shipping. See photo at left. This foam strip (called foam shipping wedge in User,s Guide) prevents the paper roll from unwinding during shipping.

Return all of the customer,s accessories.

Calibration Limits Information

Table A: *Calibration Parameters Printed on the System Status Report*

Parameter	Nominal	SW Limit Min	Expected Min	Expected Max	SW Limit Max	Comments/Description	F.C.**	S.F.***
SCAN LINE (internal)	*90	6	*60	*110	235	Reflects mechanical alignment of photodetector to CRT.	X	
GAMMA	*2.35	1.0	*2.2	*2.5	<3.0	CRT response correction exponent.		X
REFERENCE POT	NA	0	*15 (new CRT)	*60 (new CRT)	255	Adjusts for CRT aging. (*150 expected max on old CRT)		X
INTERNAL TARGET	*2250	0	*1500	*3000	4095	Absolute value read from Internal photodetector ADC when CRT is 200 c/m^2.	X	
DC OFFSET	30	0	*10	*50	1023	DC offset on internal photodetector signal.	X	
INTERNAL PEAK	Internal Target	0	Internal Target - 40	Internal Target + 40	4095	Absolute value read from Internal photodetector ADC when CRT is as close to 200 c/m^2 as the reference pot can adjust.		

* These numbers are approximate and have not been verified by statistical tracking.

** Adjusted during Factory Calibration

***Adjusted during Self Calibration

Table B: *Calibration Parameters to LCD and Serial Port: Factory Calibration*

Message	Expected Limits	Comment
INTERNAL PEAK	NA	This is a transeint message that reports DAC settings.
External Photo Sensor Stop Line	*40 min, *70 nom, *100 max	Two passes: Second pass should be within 16 of first.
External Photosensor	3000+/- 20	External target 3000 = 200c/m^2. This is how close the reference pot gets to 200 c/m^2.
DC OFFSET	Same as in table (A) above.	Same as in table (A) above.
Internal Photosensor Stop Line	Same as SCAN LINE in table (A) above.	Same as in table (A) above.
Internal Photosensor	Same as INTERNAL TARGET in table (A) above.	Same as in table (A) above.

* These numbers are approximate and have not been verified by statistical tracking.

Calibration Limits Information

Table C: Calibration Parameters to LCD and Serial Port: Self Calibration

Message	Expected Limits	Comment
Internal Photosensor	Same as INTERNAL TARGET in table (A) above.	Same as in table (A) above.
Ambient Light	82 max allowed by SW (2% of full brightness)	Keep unit as dark as possible. If this fails in dark, unit is broken, or DC offset is bad - Factory calibration needed.
REFERENCE POT	Same as REFERENCE POT in table (A) above.	Same as in table (A) above.
Dynamic Range	82 min allowed by SW (50:1)	Full screen brightness to zero screen brightness ratio.
Gamma Factor	Same as in GAMMA CORRECTION in table (A) above.	Same as in table (A) above.
Linearity	Second Column is limited to 120 (3% deviation from straight line)	First column is linear ramp target value written to DAC. Second column is photodetector reading deviation from the linear ramp. Scale is 127 - 4095.

* These numbers are approximate and have not been verified by statistical tracking.

Product Updates

Effectivity	S/N Cut-In	**DOMESTIC FDT UNITS : Description of Changes for 00710-11**
7/97	S#9700200	Sales Demo Units (all S#>9700199 and 9701000) . Monitor needs rework at some time to extend calibration life. SW Version 8.30. HW Version 50300 (MCU PCB 112037-503)
8/97	S#9701000	Initial Production units for end users (all S#>9701000). SW Version 1.20. HW Version 50300 (MCU PCB 112037-503)
8/29/97	~S#9701145	Color changes of housings:cream to gray.
9/11/97	S#9701199	HW version 50400 (MCU PCB 112037-504 for CE)
9/15/97	~S#9701210	Calibration Caps (pn112078-1) Started shipping with instruments.
10/3/97	S#9701294	SW Version 2.10 (Language translations)

Effectivity	S/N Cut-In	**CE INTERNATIONAL FDT UNITS : Description of Changes for 00710-X1 (X=2-9)** Note:Domestic S#'s have a 0 in the 3rd digit, International S#'s have a 3)
9/97	S#9731000	Initial International Production units (all S#'s>9731000) SW Version 1.20. HW version 50400 (MCU PCB 112037-504 for CE)
10/3/97	S#9731025 (also S#9731019 and S#9731023 are Ver. 2.10	SW Version 2.10 (language translations)

Chief Complaint	Cause	Corrective Action	Factory Calibration Required
Does not power up.	a) Improper fuse drawer setting.	Correct fuse drawer	No
	b) Blown fuse(s)	Replace fuses.	No
	c) Improperly wired power entry module.	Restore correct connections	No
	d) Defective transformer	Replace transformer	No
No LCD backlight or text (with high or low contrast)	a) Loose connections, damaged cables.	Check connection.	No
	b) Failed LCD module	Replace LCD	No
	c) MCU PCB defective	Replace MCU PCB	Yes
LCD has backlight but no text	a) Failed LCD contrast keypad	Clean or replace keypad	No
LCD has text but no backlight	a) Loose connections	Restore connections	No
	b) Defective LCD module	Replace LCD module	No
	c) Defective MCU PCB	Replace MCU PCB	Yes
PRB not working (patient response button)	a) Improper/Defective connection with unit	Check connections of PRB connector and MCU PCB	No
,	b) Defective PRB	Replace PRB	No
	c) Defective PRB connector	Replace PRB connector	No
	d) Defective MCU PCB	Replace MCU PCB	Yes
Unit not sure of visor position	a) Defective VPS PCB	Replace VPS PCB	No
	b) Reflective labels missing	Replace labels	No
	c) Defective MCU PCB	Replace MCU PCB	Yes
Unit will not calibrate using the calbrator	a) Defective calibrator	Check calibrator on another unit. (If calibrator is defective, send in for calibration.)	FDT does not require cal., but calibrator does need to be calibrated at factory.
	b) Defective internal light meter.	Replace internal light meter (PCB)	Yes
	c) Defective Monitor Assembly.	Replace Monitor Assemlby	Yes
	d) Defective MCU PCB	Replace MCU PCB	Yes

See next page for important note when installing a new MCU/PCB.

Chief Complaint	Cause	Corrective Action	Factory Calibration Required
No printing on paper	a) Incorrectly installed paper.	Install paper correctly referen - cing Users' Guide.	No
	b) Defective paper	Replace paper	No
	c) Incorrect paper	Replace paper	No
	d) Defective printer	Replace printer	No
	e) Wiring problems	Correct wiring or replace printer.	No
	f) Defective MCU PCB	Replace MCU PCB	Yes
RS 232 Port Malfunctions	a) No output (8.5Vac) from purple transformer wires.	Replace transformer	No
	b) Defective MCU PCB. Broken RS232 connector. (Bent pins, bad solder joint.)	Replace MCU PCB	Yes
Does not advance paper	a) Loose connectors, damaged cables.	Restore connection or replace cables .	No
	b) Defective printer motor.	Replace printer	No
Optics tube window damaged		Install new optics tube window.	Yes
Spots on optics	a) Debris on lens	Clean optics	Yes (If optics are disassembled, Factory Calibration is required due to possible change in allignment of Internal Photodetector.)

Important Note when installing a new MCU/PCB:

For new MCU/PCB,s, use the PC utility SETNVRAM to initialize NVRAM and to load the following:

PATIENT TESTS
CRT ACTIVE TIME
UNIT ON TIME
Calibration Count
S/N (Serial Number)
HW VER (Hardware Version)
MODEL NUMBER
ODOMETER SEG

REFER TO THE PC UTILITY SETNVRAM FOR MORE INFORMATION.

Power On Self Test (P.O.S.T.) Status Table

A "P.O.S.T." test is automatically programmed to occur each time the FDT unit is switched to ON. Two double "beeps" will be made by the unit near the end of the test. Four conditions can occur when the unit Powers UP: Fully Calibrated, Needs Calibration/Return Unit to Factory, Needs Self Calibration, and Hardware Failure. These are shown in the POST table below:

Printout STATUS and Message ABOUT FDT:	***Status Code*** *found in SET NVRAM utility 'RUN STATUS'*	***Display on LCD***	***Cause(s) of Message(s)***	***Next Step***
FULLY CALIBRATED	"0"	Main Menu	1.Unit passed internal calibration.	Unit is O.K.
NEEDS CALIBRATION RETURN UNIT TO FACTORY	"1"	Utilities Menu	1.Cancelled or failed factory calibration. 2.Start factory calibration. 3.Fails loading of default values to nvram.	Perform Factory Calibration
NEEDS SELF CALIBRATION	"2"	"SYSTEM FAILURE NEEDS CALIBRATION" (NOTE: Depress green button 2 times to go to UTILITY MENU to print out a report.)	1.Fails gamma checksum test. 2.Fails cal check. 3.Fails mean calc 4.Fails gamma table check. 5.Odom seg filled 6.Passed factory calibration. 7.Fail or cancel self calibration. 8.Fails nvram checksum.	Perform Self Calibration
HARDWARE FAILURE, RETURN UNIT TO FACTORY	"3"	Utilities Menu	1.Fails mean pot test. 2.Fails head temp circuit.	Perform Factory Calibration
	*NOTE: FOR VER. 2.10 SELF CALIBRATION WILL AUTOMATICALLY FOLLOW FACTORY CALIBRATION			

POST Test Key

Bit:	Test:	
0	RAM	All passed = F
1	ROM	
2	RTC INITIALIZED	
3	RTC WORKING	
4	NVRAM	All passed = F
5	MEAN CALCULATED	
6	MEAN_POT	
7	REF_POT	
8	HEAD_TEMP	All passed = 7
9	LCD MEMORY	
A	GAMMA TABLE	

→ 7FF = GOOD

NOTE:

Test results will appear on Set Up Report printout. If FDT will not print or will not complete calibration successfully, refer to Calibrat Utility for more information.

FDT Terminology

RAM	MCU board memory test. Patterns written and read from RAM. If failure occurs, look for bad solder connections or bad traces associated with the RAM.
ROM	MCU ROM checksum test. If failure occurs, first try a new software upload. If no success, look for bad solder connections or bad traces associated with the FPROM.
RTC INITIALIZED	If failure is indicated, the software has determined that the RTC was never told to start keeping time. Use WAM GT or a PC utility to initialize the clock and set the time.
RTC WORKING	If failure is indicated, the software has determined that the RTC can not be programmed to start keeping time for some reason. Check for problems on the MCU board in the areas of the RTC and the General IO sections.
NVRAM	If failure is indicated, the RTC memory checksum has failed. Use WAM GT or a PC utility to initialize the clock, set the time, and re-initialize the RTC. If this does not fix the problem, check for problems on the MCU board in the areas of the RTC and the General IO sections.
MEAN CALCULATED	The software attempts to match the shade and mask signals on the MCU board. If failure occurs, make sure that the system is calibrated. If failure still occurs, check for problems on the MCU board in the areas of the DAC, reference pot, mask pot, mask/shade comparator and the General IO sections.
MEAN_POT	This should be called "MASK POT". The software tests the mask pot by setting the mask pot to two different values, and verifies that the shade and mask match at two different values. If failure occurs, make sure that the system is calibrated. If failure still occurs, check for problems on the MCU board in the areas of the DAC, reference pot, mask pot, mask/shade comparator and the General IO sections.
REF_POT	The software tests the reference pot by setting the reference pot to two different values, and verifies that the value reported from the pseudo DAC when measuring a constant voltage (the head temperature signal) reports two different values. (Normally, the reference pot is set to its highest value, guaranteeing an accurate reference voltage to the DAC, to measure the head temperature). If failure occurs, check for problems on the MCU board in the areas of the DAC, reference pot, head temperature comparator, and the General IO sections.
HEAD_TEMP	The software tests the head temperature by setting the reference pot to its highest value, (guaranteeing an accurate reference voltage to the DAC) and then incrementing the DAC until the head temperature comparator toggles. If failure occurs, check for problems on the MCU board in the areas of the DAC, reference pot, head temperature comparator, and the General IO sections.
LCD MEMORY	The software does a RAM type memory test to the LCD. If failure occurs, look for problems in the LCD module, and the LCD ribbon cable. On the MCU board, it could be a problem with the MSB bus transceiver or the LCD section.
GAMMA TABLE	This normally gets deleted whenever a software upload is done. It is fixed by self calibration.

Error Messages

"Printer Overheated" Normal Printing Operations (Printer Tests)	This message is invoked when the video monitor shuts down the +24V when the controller board asks for it. The video monitor +24V supply is linear, and designed to shut down if the pass transistor temperature gets too hot. It is very unlikely that this will ever happen, as it has been shown that a complete roll of paper worth of consecutive tests can be printed at high line without this happening. Consecutive printer tests can do this, though, because of the higher density printout in this test. If this message appears when there has not been an extreme amount of printing, suspect the +24V enable, and the +24V supply itself.
"Too Much Ambient Light" Normal Operation or During Self Cal.	Either there is too much ambient light, or the video monitor won't dim, or the ADC on the video controller board is malfunctioning, or the Factory Cal (specifically the DC Offset or Internal Target or Internal Peak parameters) is bad.
"Data Transfer Failed" Loopback Test Only	During the RS232 testing, the data signals TXD and RXD are tested. Failure can occur with no loop back cable, bad loop back cable. If not, follow the signal paths from the MCU through the cable.
"Handshaking Failed" Loopback Test Only	During the RD232 testing, the hardware handshaking signals, CTS, RTS, DTR, DCD, and RI are tested. Failure can occur with no loop back cable, bad loop back cable. If not, follow signal paths from the MCU through the cable.
"Stop Not Found" Factory Cal. Only	During calibration, the software finds the peak of the CRT electron beam light output as it appears on the photodetector waveform. Then, during subsequent measurements, it stops sampling the light waveform at the scan line that it found the peak. This process provides for extremely precise and repeatable the light measurements. This process is used for both the internal and external light meters. It corrects for the slight differences in mechanical alignment. This failure will occur if the offending light meter is mechanically misaligned, dirty, or nonfunctional. ADC problems could also indirectly cause this message. A defective CRT could also indirectly cause this failure.
"Photosensor Not Attached" Factory Cal. Only	The software tests for this is by setting the CRT first bright, then dim, then bright, and looking for the corresponding photodetector changes. If this failure occurs, either the photosensor is not attached, not working, occluded, or the ADC is not functional. A defective CRT could also indirectly cause this failure.
"Runtime Error" Normal	This is strictly a software issue, possibly caused by ESD, induced EMI, or bad software. If it occurs, reboot the system. If it still occurs, re-load the software.

10,000 VOLTS

CAUTION

EXERCISE EXTREME CAUTION WHEN SERVICING THE FDT!

THE MONITOR ASSEMBLY OPERATES ON APPROXIMATELY 10,000 VOLTS!

4.1 REMOVAL OF REAR HOUSING/ LCD

4.1.1 Lower paper door. See photo.

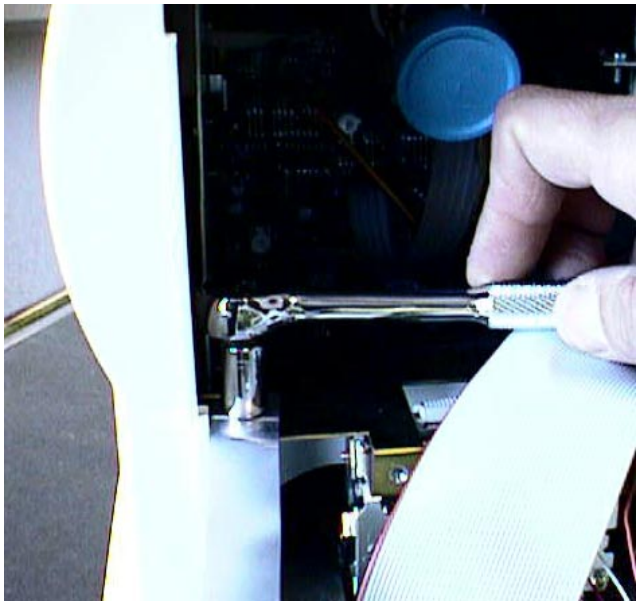
4.1.2 Remove paper:
a) pull lever down
b) pull paper out

Caution: It is essential that you use proper ElectroStatic Discharge (ESD) precautions when disassembling or handling the instrument circuitry or printed circuit boards (PCB,s). Many components in the instrument such as the MCU/PCB, are highly susceptible to static discharge damage. Keep all boards in their protective ESD packaging.

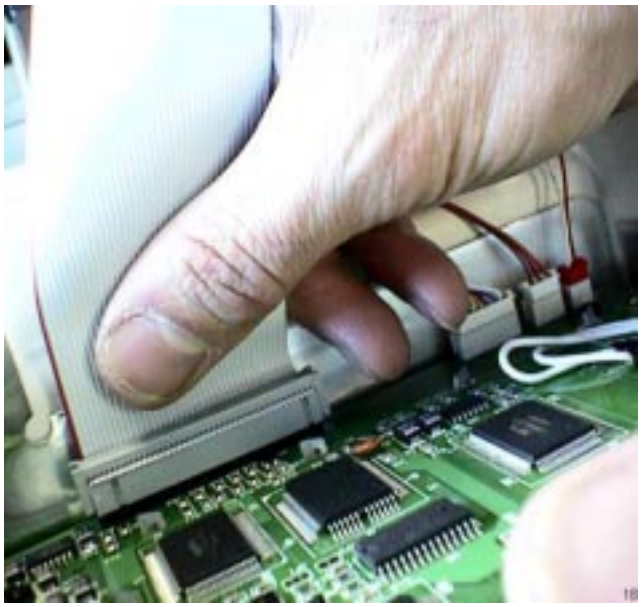
4.1.3 Remove 4 screws from rear housing.

4.1.4 Lower rear housing/LCD assembly .

4.1.5 Disconnect LCD ESD shield strap from upper printer shelf. Use 11/32" socket to remove nut.



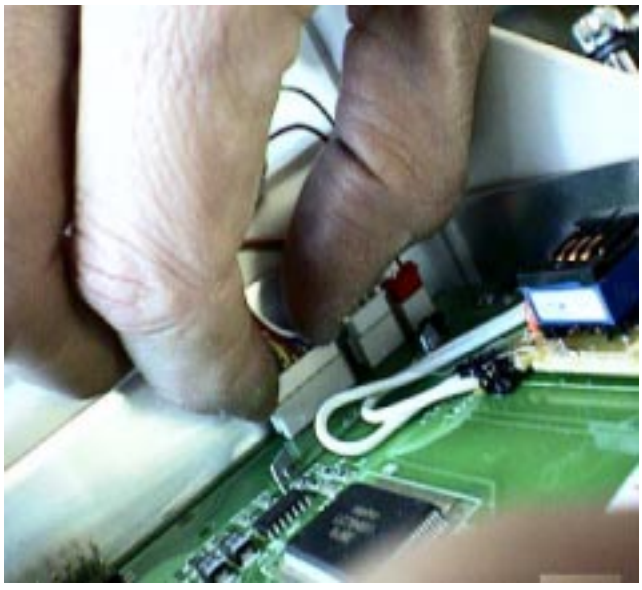
4.1.6 Disconnect wiring from LCD/PCB:
a) Pull Printer Ribbon Cable connector J1 from LCD/PCB .



4.1.6 Disconnect wiring from LCD/PCB:
b)Disconnect 3 connectors (shown in photo from left to right)
Stepper Motor Connector - P3
Paper Out Connector - P2
Head Up Connector - P1

4.1.7 Place rear housing/LCD sub assem bly into a clean anit-static bag for later use.

4.1.8 Pull paper door up from base housing.



4.2 REPLACEMENT OF REAR HOUSING/LCD ASSEMBLY

4.2.1 Reassemble in reverse order with following notes:
a) Push Keyed ribbon cable into connector J1 of the LCD module.
b) Run wire assemblies OVER the ribbon cable.
c) Restore P1, P1, and P3 connections to the LCD/PCB.
d) Ensure that the LCD ESD ground shield stays on the inside of the rear housing as rear housing/LCD sub assembly is closed. See photo.

4.2.2 Plug unit in and turn on

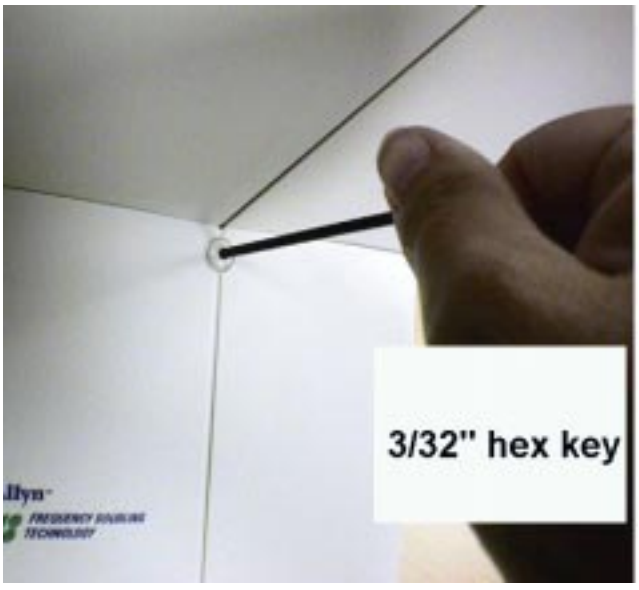
4.2.3 Replace paper roll per instructions in user's manual.

4.2.4 Close paper door.

4.3 DISASSEMBLY OF OPTICS

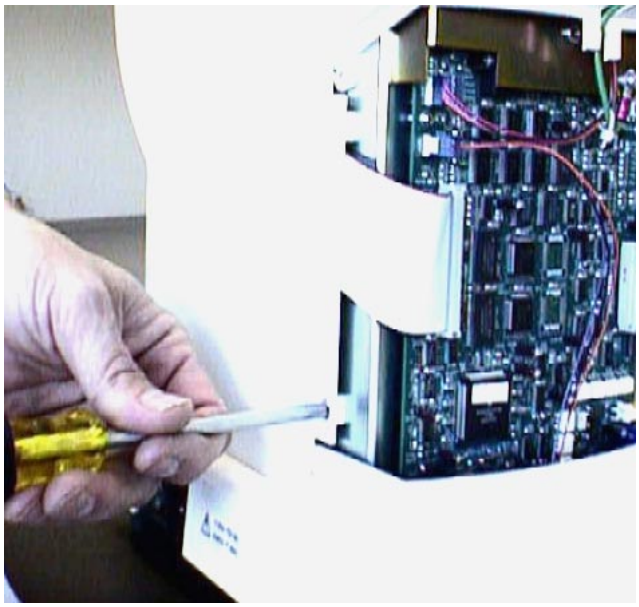
4.3.1 Remove rear housing/LCD sub assembly. **(Refer to 4.1)**

4.3.2 Remove front housing:
a) Remove screw from front housing
b) Pull front housing out

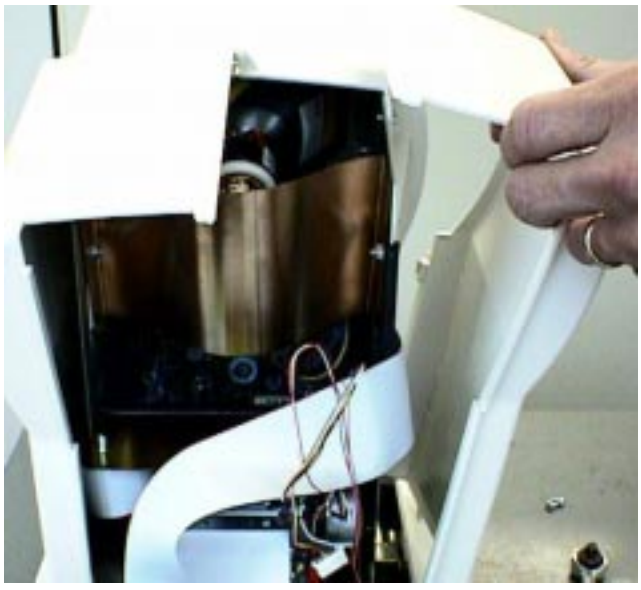


4.3.3 Remove left and right rear housings:
a) Pull clip from top of housings.
b) Remove screw from top inside of unit to disconnect side housings from front housings. (Use magnetic tip screwdriver to keep the screw from falling into the unit.)

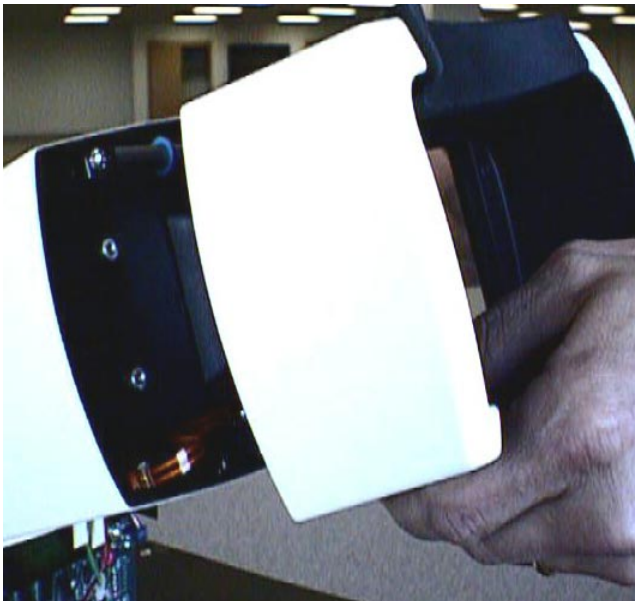
4.3.3 Remove left and right rear housings:
c) Remove 2 screws that connect each housing to chassis.



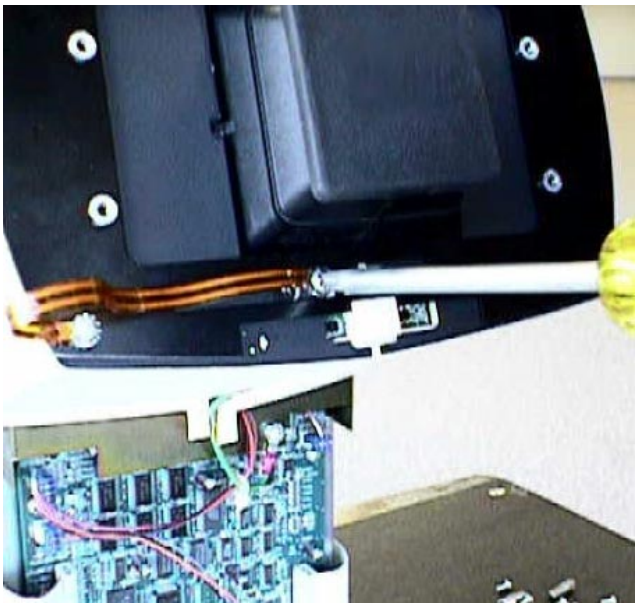
4.3.3 Remove left and right rear housings:
d)Pull housing up and out of base assembly



4.3.4 Remove visor/browrest assembly:
a) Unscrew 4 set screws (7/64” key)
b) Pull visor/browrest assembly off.



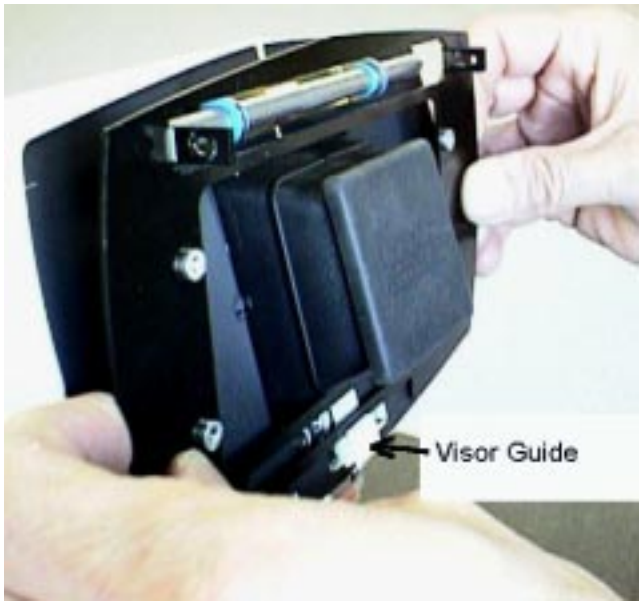
4.3.5 Remove screw and lockwasher from right side of ground cable.



4.3.6 Remove slide/bracket/ rod assembly:
a)Remove screw and lock washer at each end of the slide bracked/rod assembly.

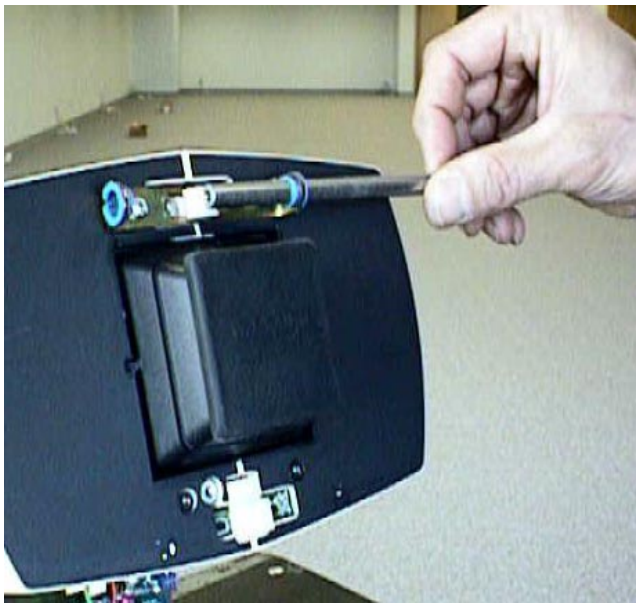
4.3.6 Remove slide/bracket/ rod assembly:
b)Remove visor backplate from visor guide by lifting out from top, then up.

Caution: Do not break the visor guide (indicated by arrow in photo graph) in this step! Do not pull the visor backplate out too far as this will break the visor guide!



4.3.6 Remove slide/bracket/ rod assembly:
c)Remove rod from slide-bracket.

Note: Place finger on visor wear pad to prevent it from falling.



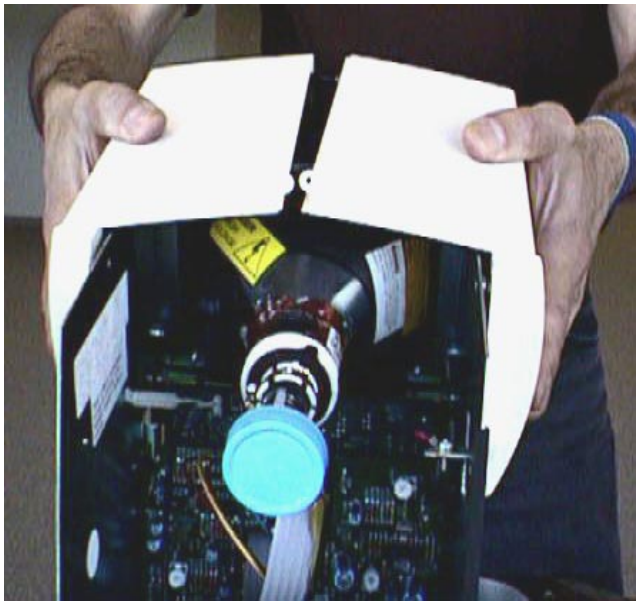
4.3.6 Remove slide/bracket/ rod assembly:
d)Remove visor wear-pad and visor spring bracket.

4.3.6 Remove slide/bracket/ rod assembly:
e)Remove 2 screws.
f)Remove bracket.

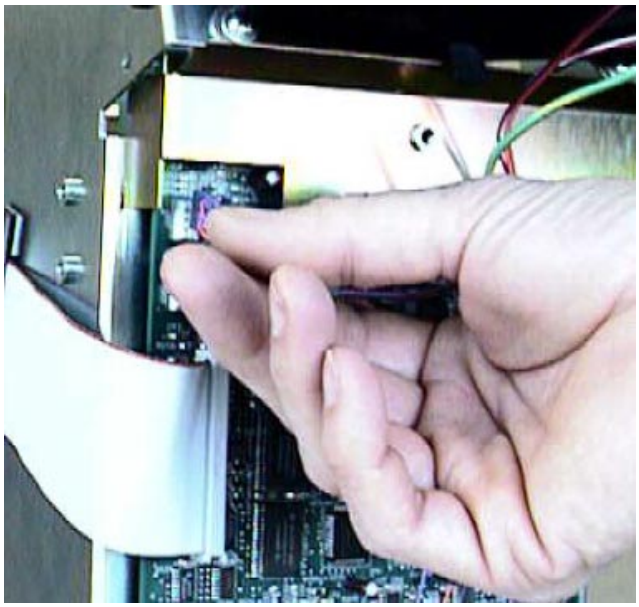
4.3.7 Remove front left and front right housings:
a)Remove two black screws from front of housings.

4.3.7 Remove front left and front right housings:
b)Remove the rear EMI shield by removing the nut on each side (shown in Photo Inset) Use 11/32" wrench or socket.
c)Remove 3 screws from each housing.

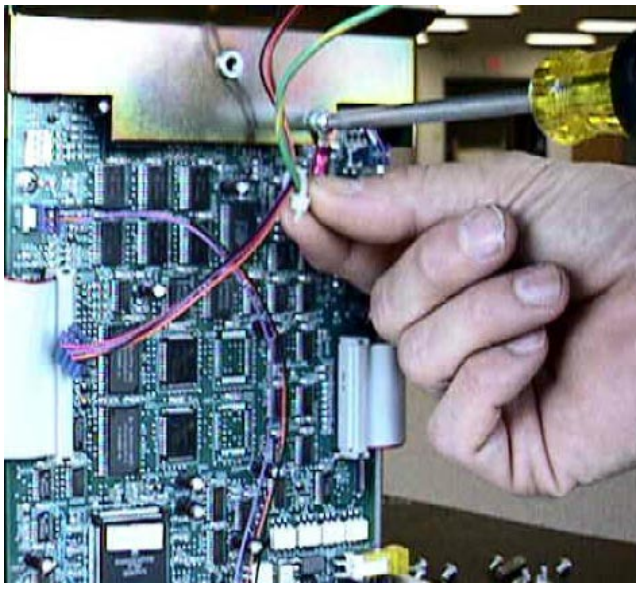
4.3.7 Remove front left and front right housings:
d)Spread and lift housings from base.



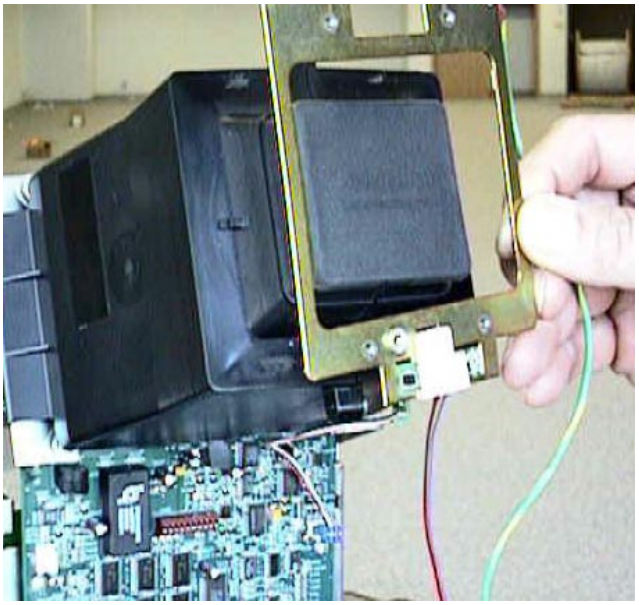
4.3.8 Disconnect wiring:
a) Pull the VPS wires from J107 of the MCU PCB.



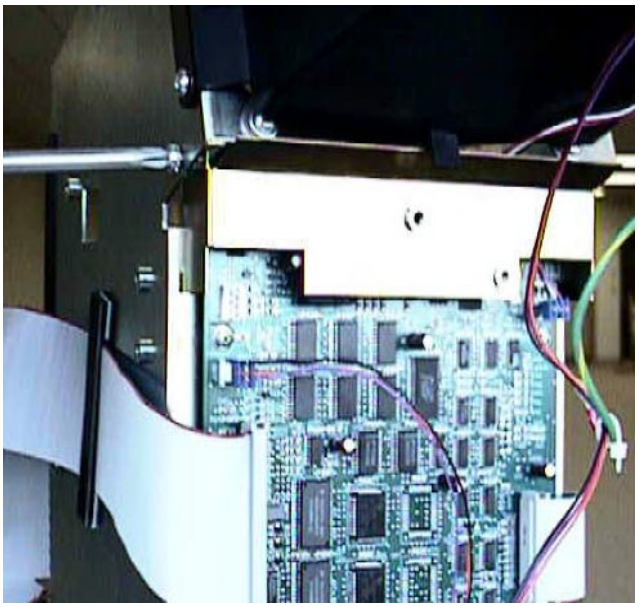
4.3.8 Disconnect wiring:
b) Remove the screw and lock washer which attaches the ground wire ring terminal to the front ESD shield.



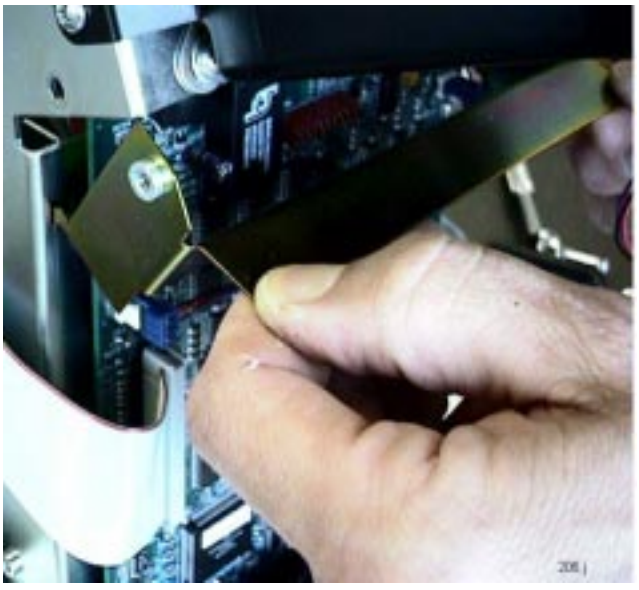
4.3.8 Disconnect wiring:
c)Lift front housing backplate from optics tube assembly.



4.3.9 Remove front ESD shield:
a)Remove screws from both ends of shield.

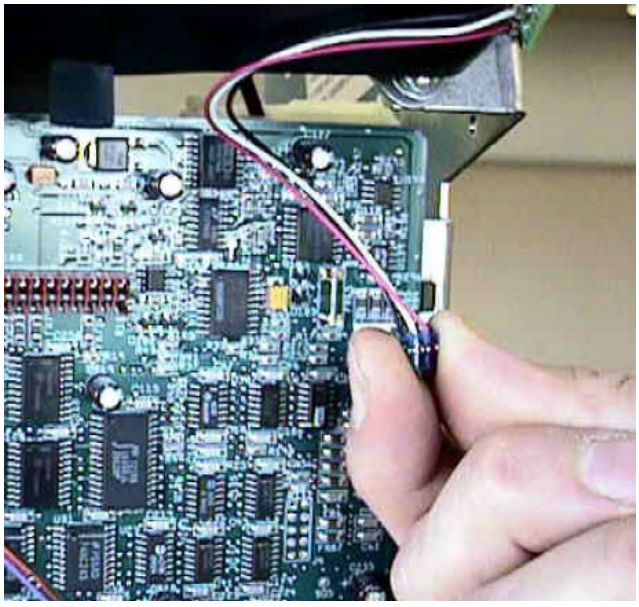


4.3.9 Remove front ESD shield:
b) Gently pull front ESD shield from chassis without contacting compo nents on the PCB.



4.3.9 Remove front ESD shield:

c)Disconnect IP (Internal Photodetector) connector from J110 of MCU/ PCB.



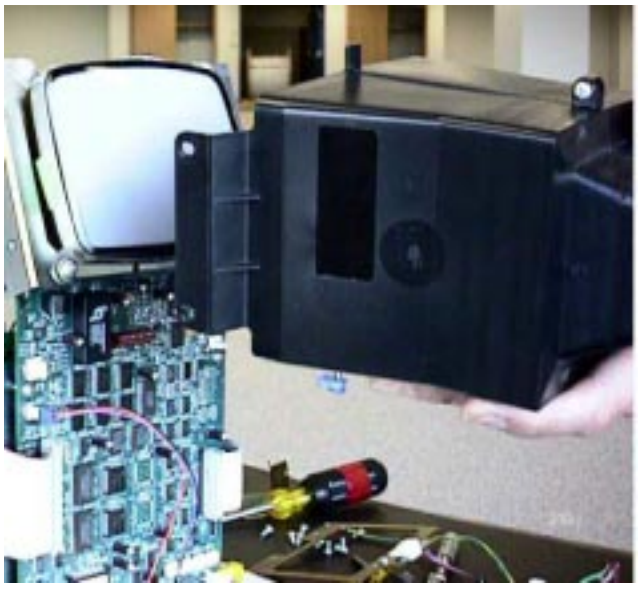
4.3.10 Remove optics tube assembly:

a)Remove 4 screws while supporting optics tube assembly.

4.3.10 Remove optics tube assembly:

b)Remove optics tube assembly.

c)Put optics tube assembly into dust free container or bag.

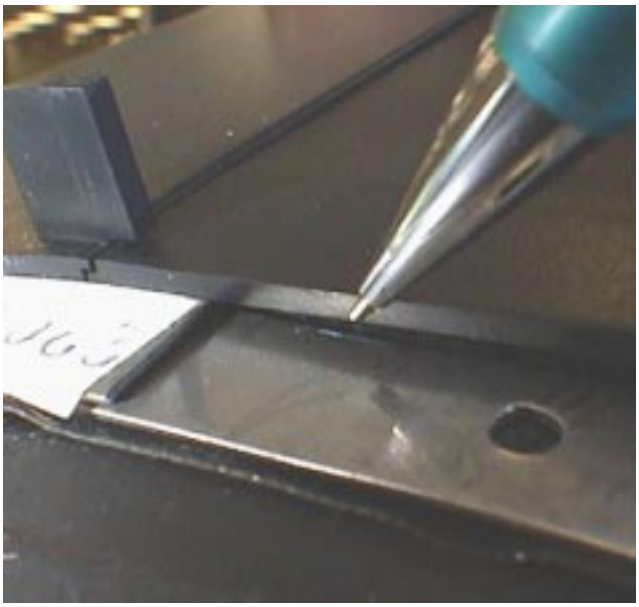


4.4 ASSEMBLY OF OPTICS

4.4.1 Replace the optics tube assembly:
a)Place foam gasket into position.

Note: Notches on left and right sides of foam gasket must fit over the tabs.

4.4.1 Replace the optics tube assembly:
b)Hold the optics tube assembly with the IP PCB on the right side and fit it onto the monitor.



4.4.1 Replace the optics tube assembly:
c)Position the optics tube assembly all the way on to the Monitor/Chas sis assembly. Make sure the optics tube assembly is not caught on the CRT band on top. Check slotted holes. Photo at right depicts right side of optics tube assembly positioned all the way onto the chassis.

d)Install and tighten 4 screws.

4.4.2 Place front housing backplate on to front of optics tube assembly.(See step 4.3.8)

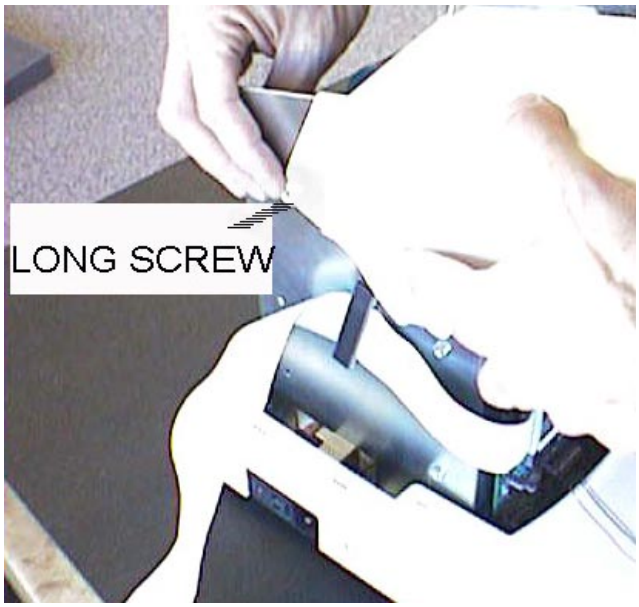
4.4.3 Replace front ESD shield and restore connector to J110 of MCU PCB :(See 4.3.10 a,b,c)

4.4.4 Restore wiring connections:
a)Ground Wire (See 4.3.9 b)
External Tooth lockwasher must be used for ground connection.
b)VPS wire connector to J107 of MCU PCB (See 4.3.9 a)

4.4.5 Replace front left and right housings:
a)Place wires while installing front right housing.

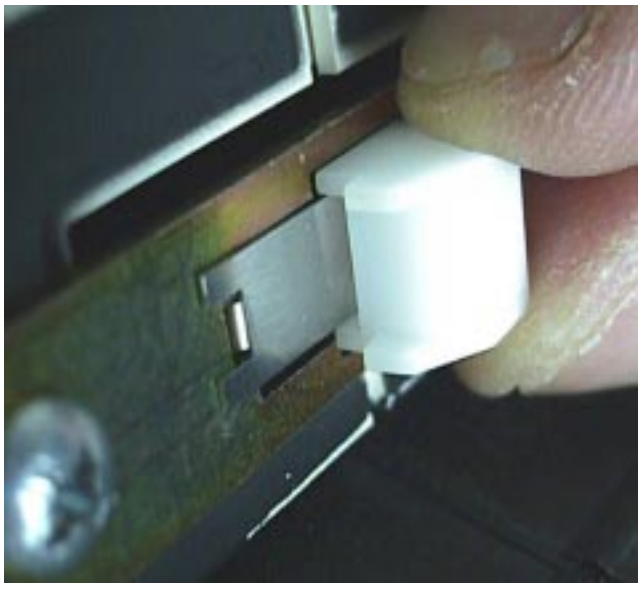
Note: Proper alignment of front right and left housings is critical to proper sliding of visor. See photo for notch/tab relationship.

4.4.5 Replace front left and right housings:
b)Put housings onto threaded studs at corners (this photo.)
c)Install slide/bracket rod assembly (See 4.3.6)
d)Install 2 black screws into front housings (See 4.3.8)
e)Fasten left and right housings with 3 screws each. Use the longer where shown.



4.4.6 Install Rear EMI shield:
a)Shield must contact but not move BLUE CAP of CRT. Put shield over screws. Tighten nuts. See Tools.

4.4.7 Install Rod into slide bracket:
a)Put visor spring and visor wear pad into position.

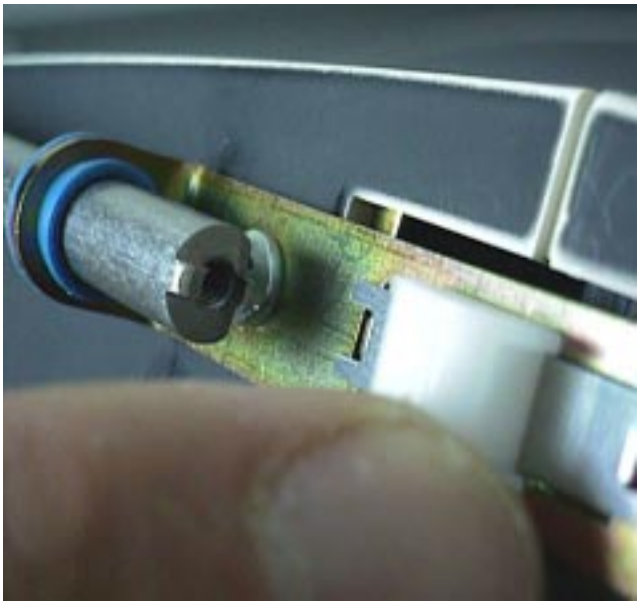


4.4.7 Install Rod into slide bracket:

b)Hold wear pad in place and slide the rod (as shown in photo) in from the left side of bracket.

c)Test this assembly by sliding the rod left and right. **The rod must engage the detent at each end of the stroke to pass the test.**

d)Put rod in center position.



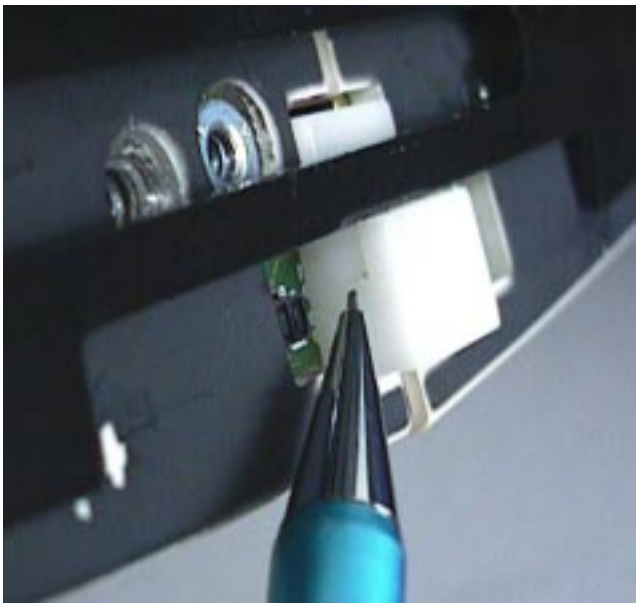
4.4.8 Install visor backplate:

a)Put visor backplate into notch in visor guide as shown in photo.

b)Put visor backplate over the slide bracket/rod assembly. (See 4.3.6)

c)Attach visor backplate to rod with screws and lockwashers. (See 4.3.6)

d)Restore ground cable connection with screw and External tooth lockwasher. (See 4.3.5)



4.4.9 Install visor/browrest sub assembly:

a)Slide the visor backplate to right.

b)Put visor/browrest onto visor backplate **with ground cable in position shown in photo.**

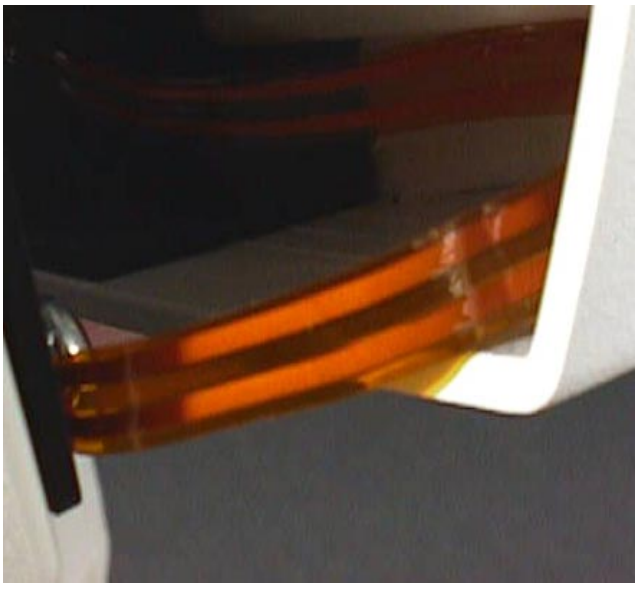
c)Secure with 4 set screws.

d)Test this assembly by sliding left and right. **The Visor must:**

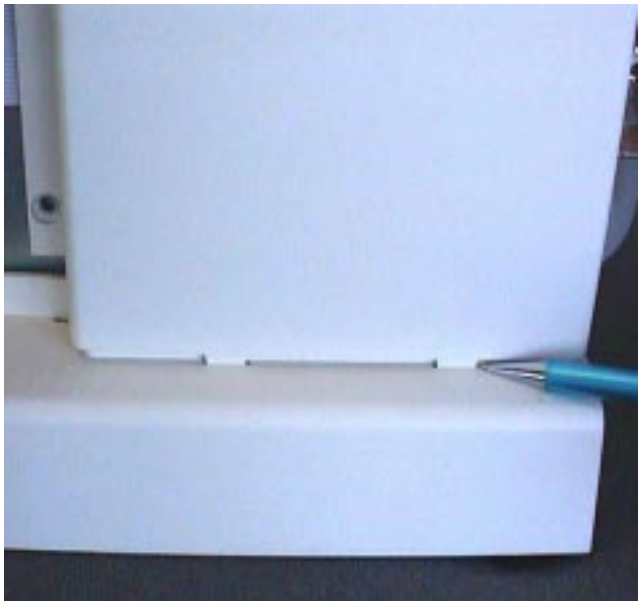
1)move smoothly

2)click (detent) at end of stroke.

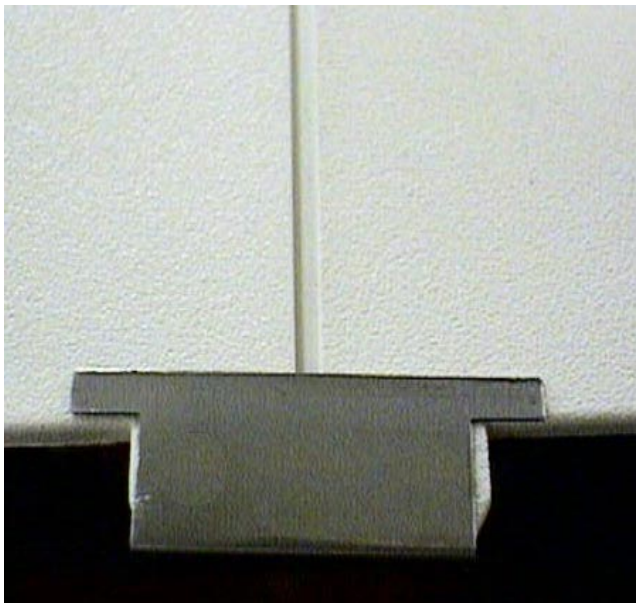
3)not rub the ground cable.



4.4.10 Install left and right rear housings:
a)Put side housing bottom tabs into slots in base.
b)Secure each cover with 2 screws (See 4.3.3 c)
c)Fasten covers inside upper section with one screw(See 4.3.3 b)



4.4.10 Install left and right rear housings:
d)Put clip on covers.



4.4.11 Install front housing:
a)Align tabs and secure with one central screw. (See 4.3.2 a)

4.4.12 Install rear housing/LCD assembly:
a)Follow instructions in Section 4.2

NOTE: **If a new Internal Photodetector board was installed, perform a Factory Calibration.**

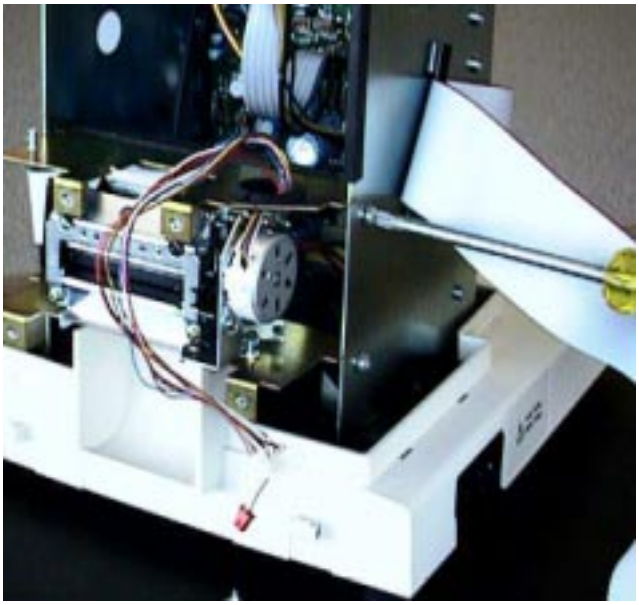
4.5 REMOVAL OF PRINTER

Note: Printers on early model FDT's have upper and lower printer shelves. Later FDT units use printer enclosures which are described in Section 9.5.

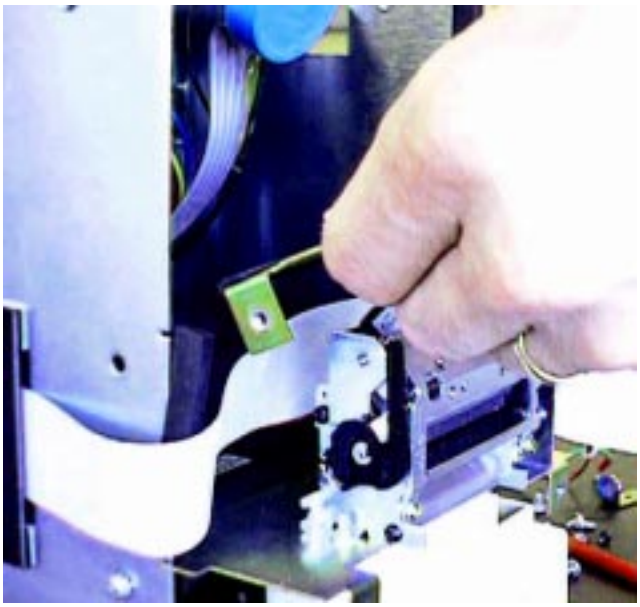
4.5.1 Remove rear housing/LCD assembly (See 4.1)

4.5.2 Remove left and right rear housings (See 4.3.3)

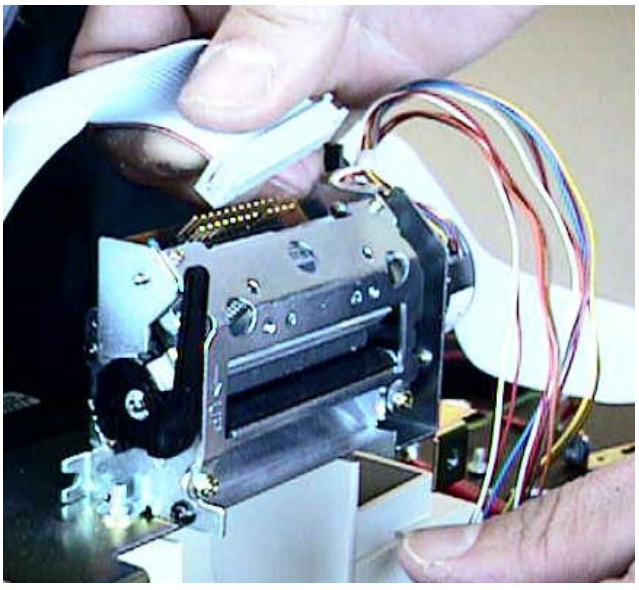
4.5.3 Remove upper printer shelf (see photo):
a)Remove 2 screws with washers.



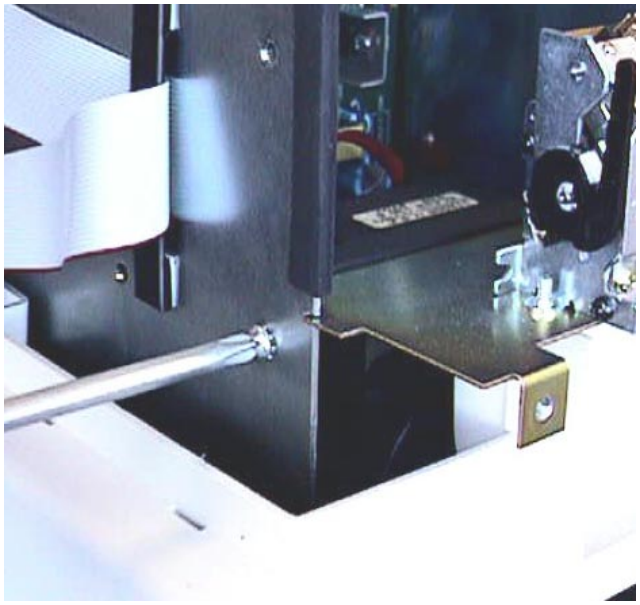
4.5.3 Remove upper printer shelf (see photo):
b)Lift shelf out .



4.5.4 Remove ribbon cable from printer.

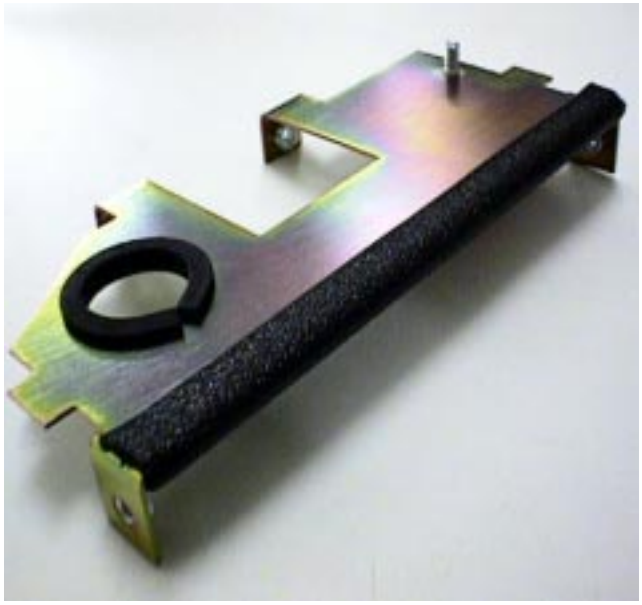


4.5.5 Remove printer plate:
a)Remove 2 screws with washers.
b)Pull printer plate from chassis



4.6 INSTALLING PRINTER

4.6.1 Attach edge protectors as follows: (see assembly drawing for exact locations of edge protectors)
a)1 for each side of chassis
b)1 on the back of both printer plates (shelfs).
c)1 circular protector on upper printer plate (shown in photo).



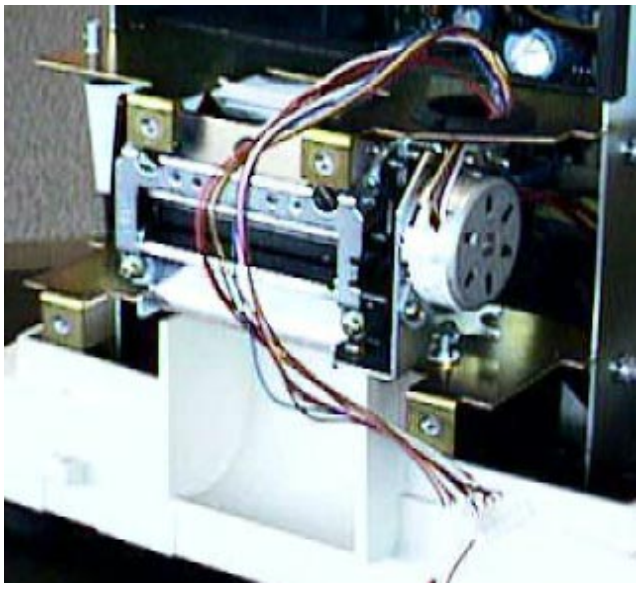
4.6.2 Install printer/printer plate assembly on chassis:
a)Secure with 2 screws.
b)Connect ribbon cable (keyed)

4.6.3 Replace upper printer shelf.See 4.5.3
a)Secure with 2 screws.

4.6.4 Install left and right rear housings. (See 4.4.10)

4.6.5 Install front housing.(See 4.4.11)

4.6.6 Install rear housing/LCD assembly. (See 4.4.12)

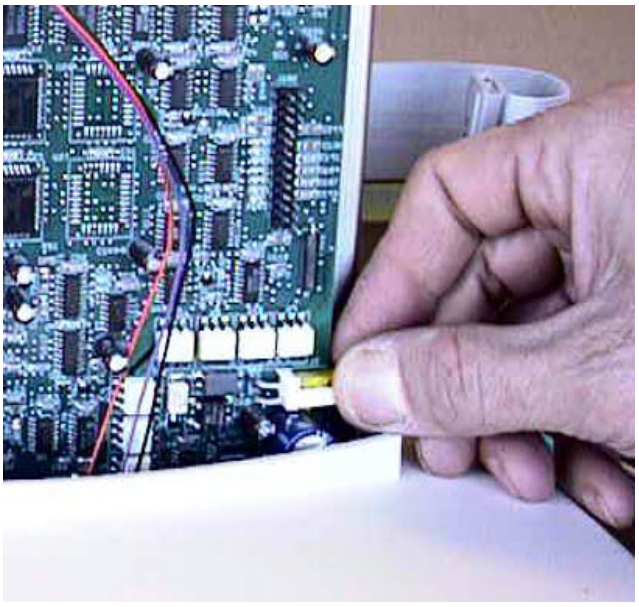


4.7 REMOVAL OF MCU PCB

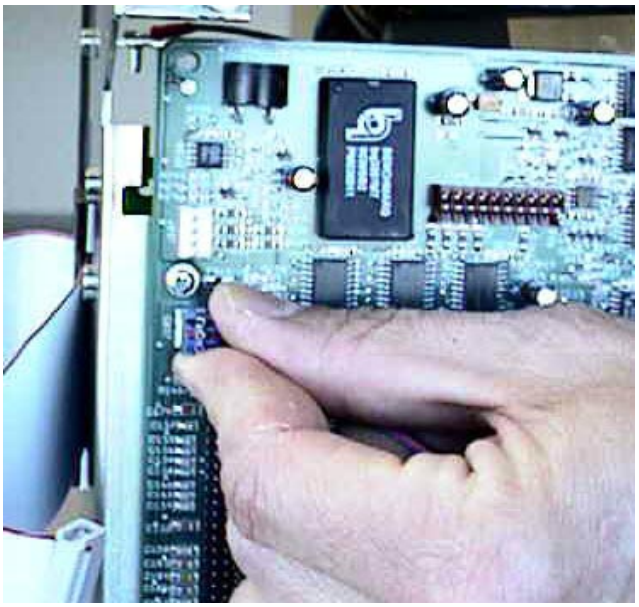
4.7.1 Remove rear housing/LCD assembly. (See 4.1)

4.7.2 Remove Optics up to, but not in cluding the optics tube assembly. (See 4.3.1 through 4.3.10)

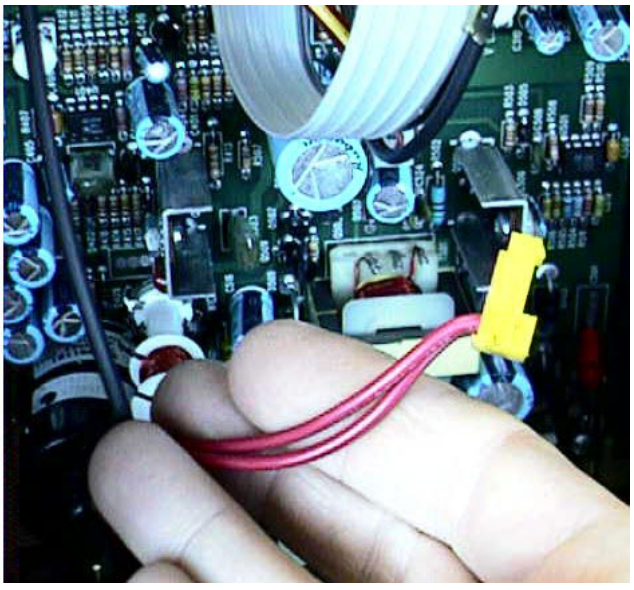
4.7.3 Disconnect wiring:
a)Unplug J7 and J102 of MCU PCB.
b)Unplug J1 (Shown in Photo)



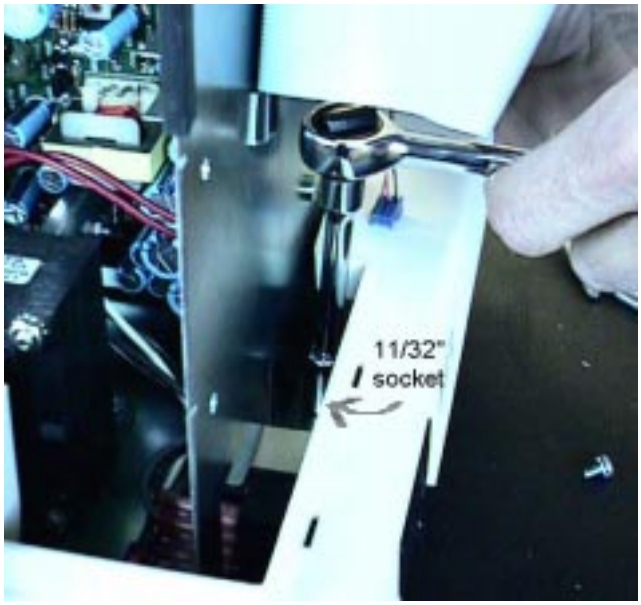
4.7.3 Disconnect wiring:
c)Unplug PRB wire from J105 of MCU PRB.



4.7.3 Disconnect wiring:
d)Unplug P5 from Monitor Board.



4.7.4 Remove Chassis/Monitor/MCU assy:
a)Use 11/32” socket and extension to remove 4 nuts at base of chas sis.



4.7.4 Remove Chassis/Monitor/MCU assy:
b)Tilt chassis/Monitor/MCU assy. forward as you lift up.

CAUTION: Do not allow the MCU board to contact front edge of opening in base (SEE arrow in photo.)

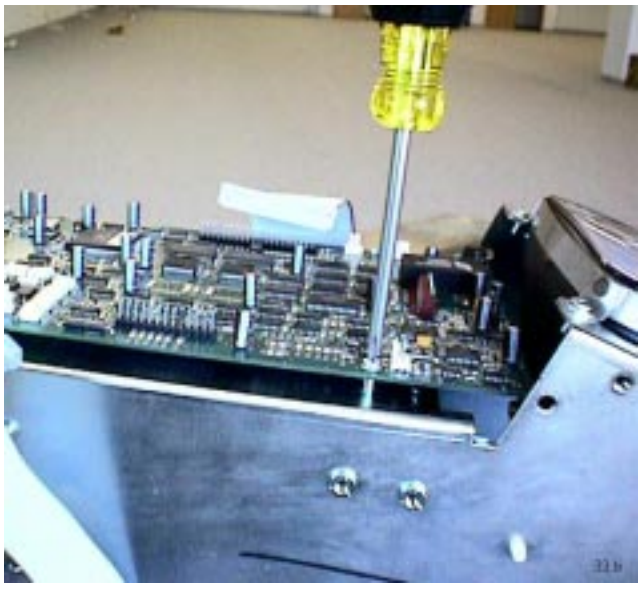
c)Lift assembly straight up from base.

CAUTION:See caution note and Photo #3 on page 3 of Section 1 regarding not standing the chassis monitor asembly on the (RS232) connec of the MCU/PCB.

4.7.5 Remove MCU/PCB from Chassis:
a)Remove 4 screws with split lockwashers from MCU/PCB four corners.
b)Gently remove MCU/PCB .

CAUTION: There are Board to Board pin connectors (J108 and J109)at the top and bottom of the MCU/ PCB. Separate the boards carefully.

c)Remove PCB TO PCB connectors from board and store board in antistatic bag



4.8 INSTALLING MCU/PCB

NOTE: Use PC utility to initialize/set NVRAM when installing new MCU/PCB. Factory calibration is also required.

4.8.1 Install MCU/PCB

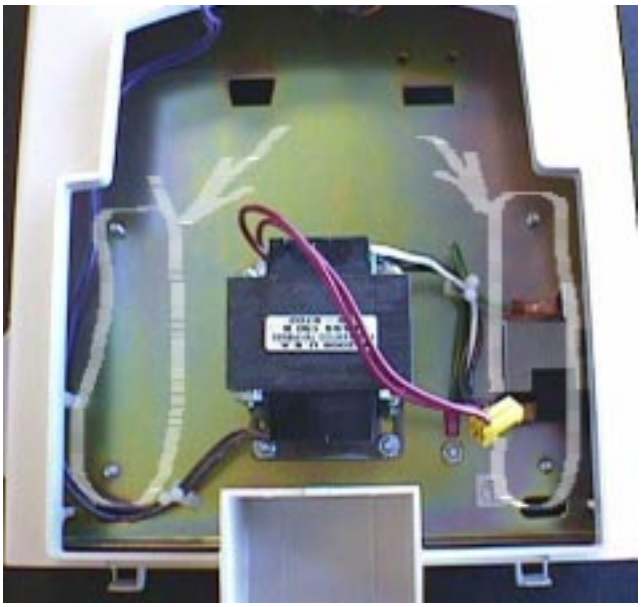
a)Insert Connector,PCB to PCB (pn 112086) into top and bottom sockets of new MCU/PCB.

b)Align the pins with the sockets of Monitor Board in chassis and gently press boards together.

c)Secure with 4 screws.

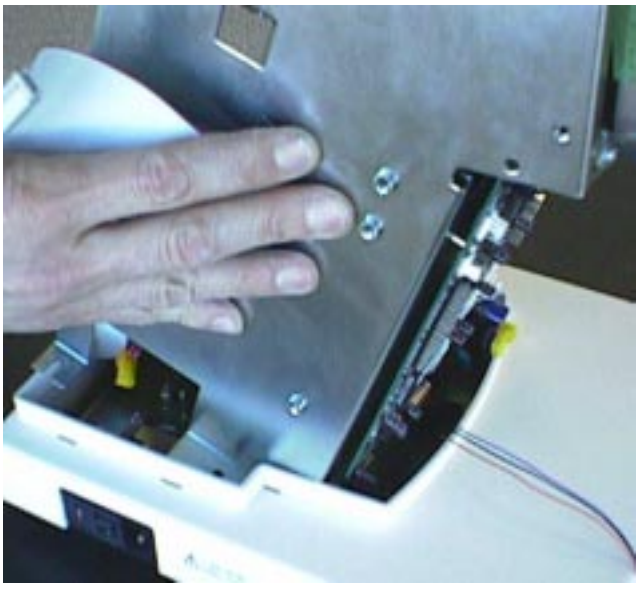
4.8.2 Install Chassis/Monitor/MCU assy.

a)**Important:**Move all wires from footprint area of the chassis to avoid pinching of wires.



4.8.2 Install Chassis/Monitor/MCU assy.

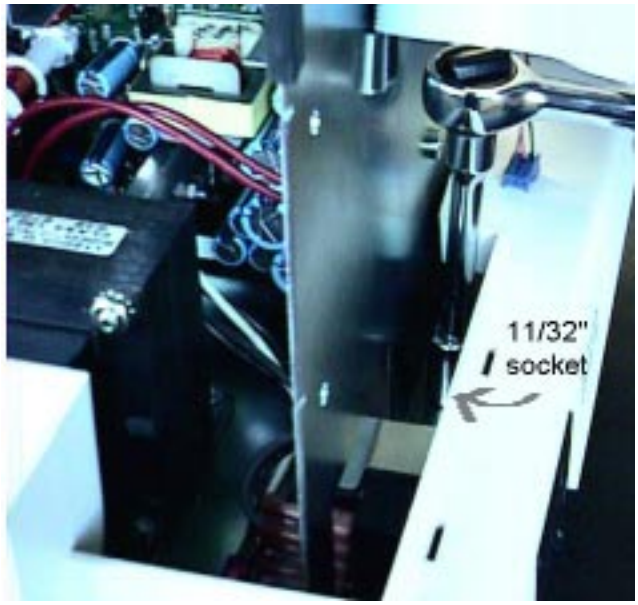
b)Tilt the chassis assembly forward.



4.8.2 Install Chassis/Monitor/MCU assy.
c)Position chassis onto base plate threaded studs.
d)Secure the chassis with 4 nuts.

4.8.3 Complete the installation of the MCU/PCB by following steps 4.7.1 - 4.7.3 in reverse order.

NOTE: Use PC utility to initialize/set NVRAM when installing new MCU/PCB. Factory calibration is also required. See Section 3 pg. 2 for additional information on PC utility.



4.9 INSTALLING A REPLACEMENT CHASSIS/MONITOR ASSEMBLY

4.9.1 Secure ribbon cable clamps to chassis **over** ribbon cables.

4.9.2 Install MCU/PCB to new chassis.

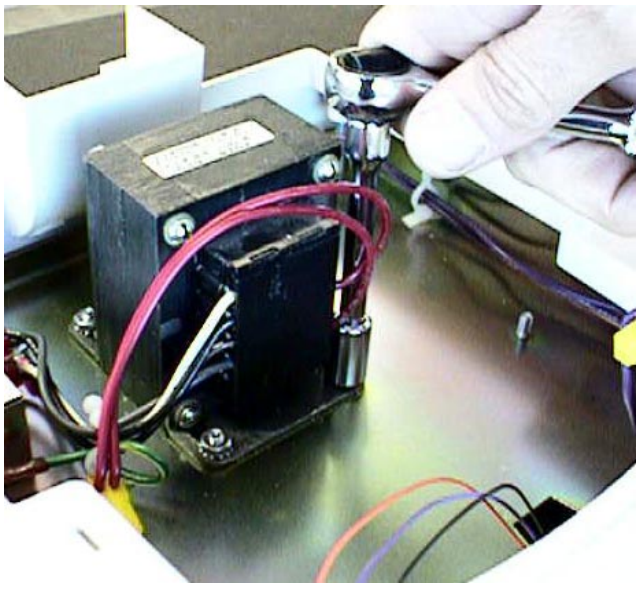
4.9.3 Reassemble unit. Follow steps 4.7.1 through 4.7.3 in reverse order.

NOTE: The chassis/monitor assembly is a matched set. If either the CRT or the Monitor PCB fails, a new matched chassis/monitor assembly must be installed or the FDT will not function properly. DO NOT ADJUST POTS!

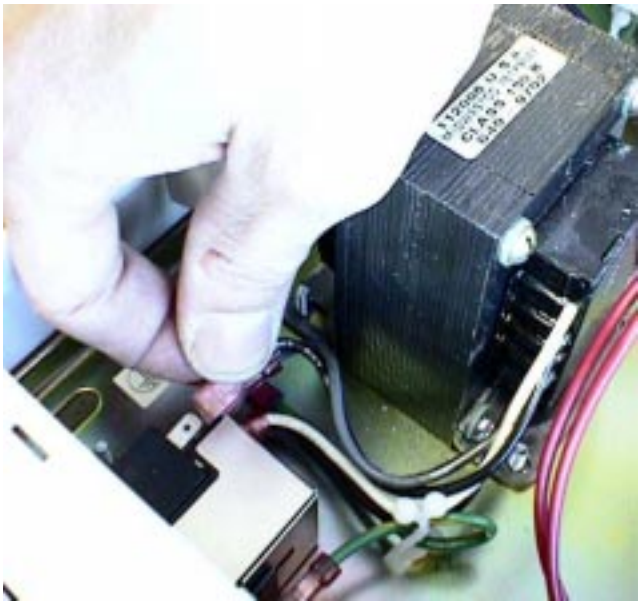
4.9.4 Perform a Factory Calibration only if you installed a new Chassis/Monitor.

4.10 REMOVAL OF TRANSFORMER

4.10.1 Remove rear housing/LCD assy. (Sect. 4.1.1 - 4.1.8)
4.10.2 Remove front housing. (Sect. 4.3.2)
4.10.3 Remove left and right rear housings. (Sect 4.3.3)
4.10.4 Disconnect J1 and J105 from MCU.
4.10.5 Partially lift Chassis/Monitor assembly from base and disconnect P5 from Monitor Board.
4.10.6 Remove Chassis/Monitor assembly. (Sect. 4.7.4)
4.10.7 Remove Transformer from base.
a)Remove 4 nuts with 11/32” socket.



4.10.7 Remove Transformer:
b)Disconnect transformer wires from power entry module.
c)Lift transformer from base.



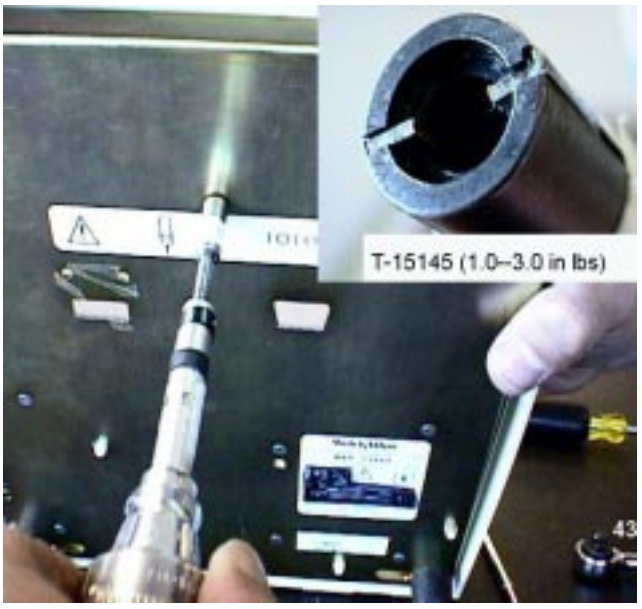
4.11 INSTALLING TRANSFORMER

4.11.1 Install transformer in reverse order of removal.

4.11.2 Restore wiring connections.
a)Refer to Sheet 2 of Drawing #112000 for correct placement of transformer wires to power entry module.

4.12 REMOVAL OF PRB JACK

4.12.1 Remove rear housing/LCD assy. (Sect. 4.1.1 - 4.1.8)
4.12.2 Remove front housing. (Sect. 4.3.2)
4.12.3 Remove left and right rear housings. (Sect 4.3.3)
4.12.4 Remove Upper printer shelf. (Sect 4.5.3)
4.12.5 Disconnect J1 and J105 from MCU.
4.12.6 Disconnect P5 from Monitor Board.
4.12.7 Remove Chassis/Monitor assembly. (Sect. 4.7.4)
4.12.8 Unscrew Ring Nut of PRB Jack with T-15145 (See Photo)



4.13 REPLACEMENT OF PRB JACK

4.13.1 Install new PRB Wire Assembly (jack and wire harness) in reverse order of disassembly.

4.14 REMOVAL OF POWER ENTRY MODULE

4.14.1 Remove Chassis/Monitor assembly per above steps 4.12.1-4.12.7.
4.14.2 Separate Housing and Base Plate:
a)Remove 4 screws from rubber feet.
b)Lift housing from base.

4.14.3 Remove wires from module.

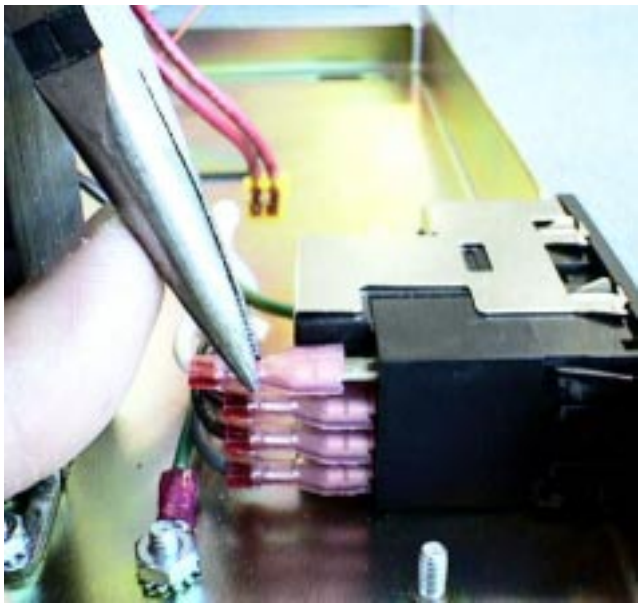
4.14.4Slide power entry module up and out of base plate.

4.15 REPLACEMENT OF POWER ENTRY MODULE

4.15.1Install power entry module.
a)Press power entry module into base plate assembly.

4.15.2 Restore wiring connections.
a)Refer to Sheet 2 of Drawing #112000 for correct placement of wires to power entry module.

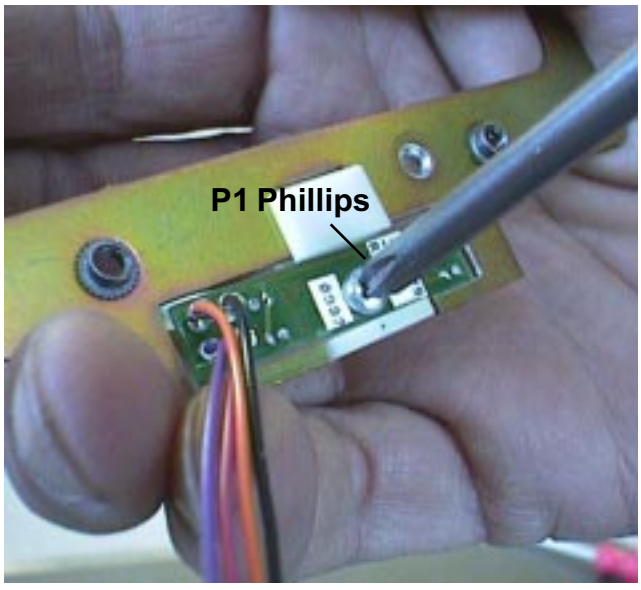
4.15.2 Replace the housing in reverse order. (See 4.14.1- 4.14.2)



4.16 REMOVAL OF VISOR POSITION SENSOR (VPS) PRINTED CIRCUIT BOARD (PCB)

4.16.1 Disassemble optics to VPS/PCB (See 4.3)

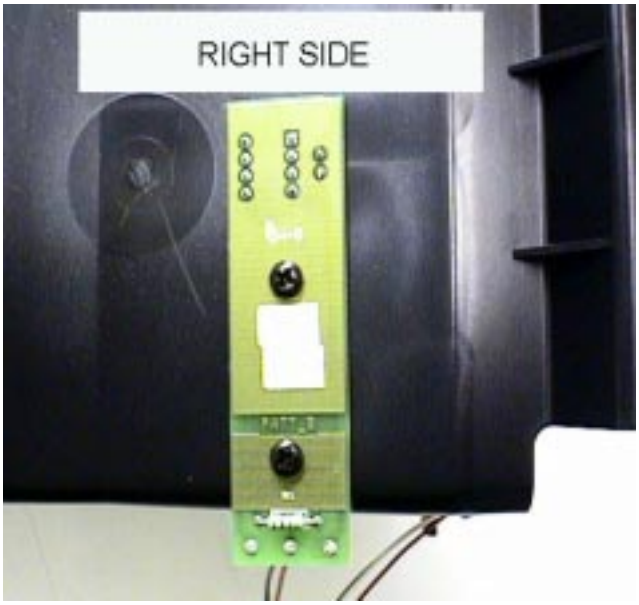
4.16.2 Remove VPS/PCB
a)Cut cable tie.
b)Remove screw as shown in photo.
c)Disconnect VPS/PCB from front housing backplate.



4.17 REPLACEMENT OF VPS/PCB

4.17.1 Install VPS/PCB in reverse order.

4.18 REMOVAL OF INTERNAL PHOTO DETECTOR (IP) PCB.



4.18.1 Disassemble optics to optics tube assembly. (See 4.3)

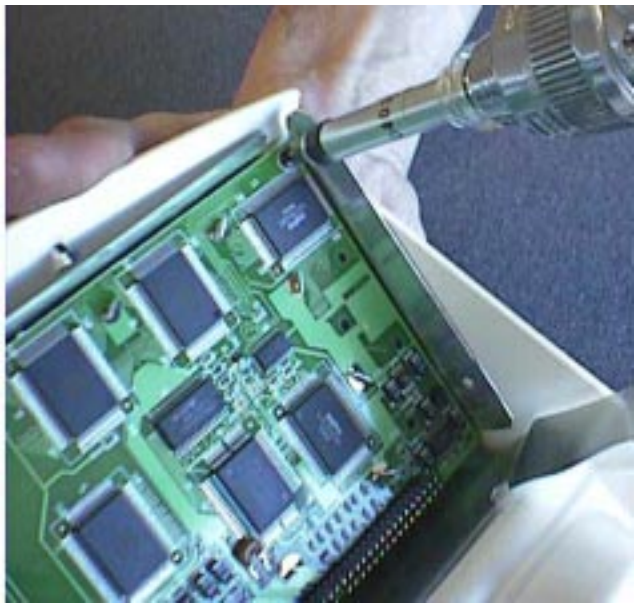
4.18.2 Remove 2 screws from IP/PCB .

4.19 REPLACEMENT OF IP/PCB.

4.19.1 Install IP/PCB in reverse order of removal. Make sure sensor is clean.

NOTE:If you replaced the IP with a new IP, factory calibration is required.

4.20 REMOVAL OF LCD MODULE/ KEYPAD



4.20.1 Remove Rear housing/LCD subassembly. Follow instructions in Sect. 4.1.1 through 4.1.6.

4.20.2 Remove LCD module.
a)Unscrew 4 screws from module.

Note: Do not lose the insulating plastic washer from screw shown in photo.

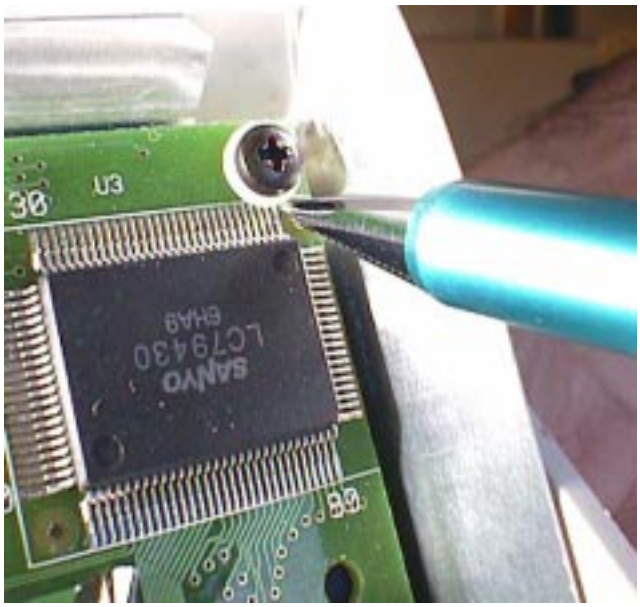
4.20.2 Remove LCD module.
b)Carefully lift module from housing.

4.20.3 Remove keypad
a)Lift keypad from housing.

4.21 REPLACEMENT OF LCD MODULE/ KEYPAD

4.21.1 Perform LCD module/keypad removal in reverse order.

NOTE: Install plastic insulating washer in position as shown in photo. This screw prevents shorting of adjacent component and is found in both CE and non CE units.

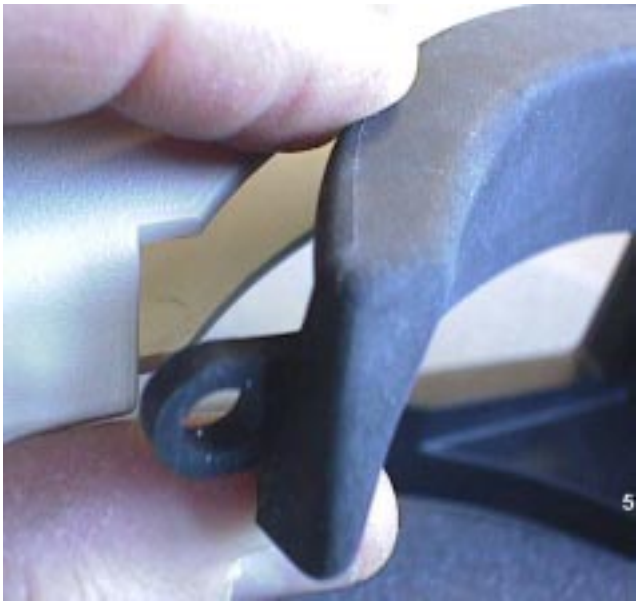


4.22 REMOVAL OF VISOR PAD

4.22.1 Remove visor/browrest sub assembly (Sect. 4.3.4)

4.22.2 Remove visor pad
a)Pull and press simultaneously in directions of arrows as shown in photo.
b)Repeat with other end of visor pad.

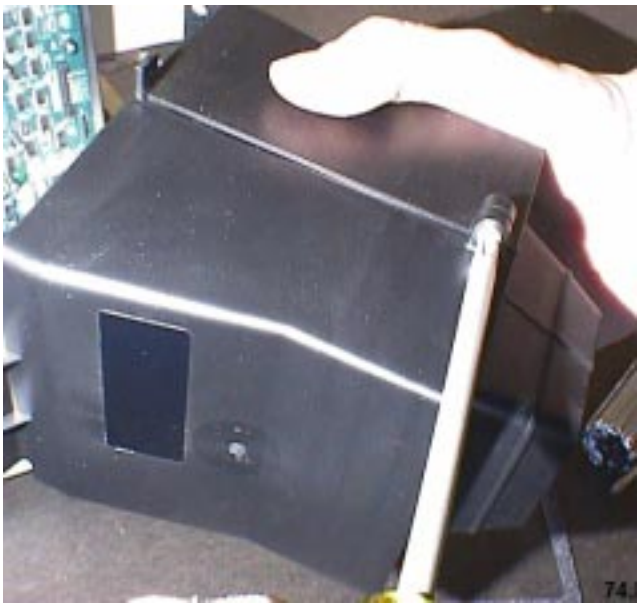
4.23 INSTALLING VISOR PAD



4.32.1 Install visor pad.
a)Place visor into visor as shown.
b)Press loops over posts on inside of visor.

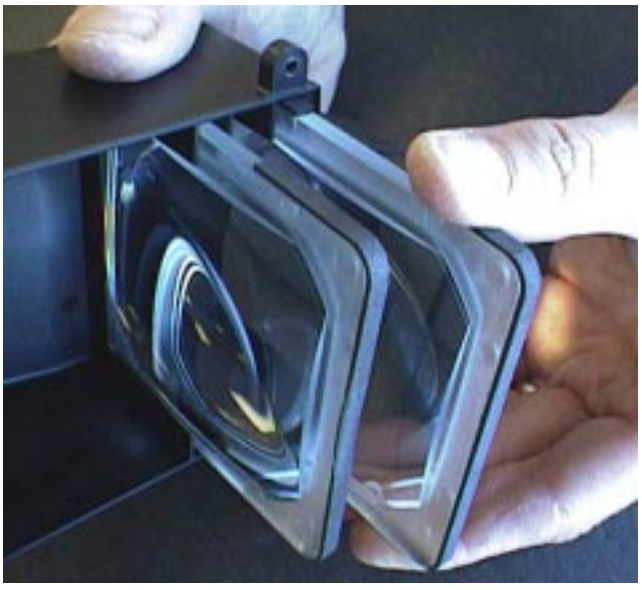
4.23.2 Replace visor/browrest sub assembly (Sect. 4.4.9)

4.24 REMOVAL OF ACRYLIC LENSES and OPTICS TUBE WINDOW



4.24.1 Remove optics tube assembly (Sect. 4.3)

4.24.2 Remove optics tube housing:
a)Remove screws that hold housings together.
b)Carefully pull one housing off.



4.24.3 Remove acrylic lenses and or optics tube window by holding edges and gently sliding them from the optics tube.

4.24.4 If lenses or optics tube window are dirty, clean with a swab and alcohol and air dry.
If a lens cannot be cleaned, install a clean replacement lens.

4.25 INSTALLING ACRYLIC LENSES and OPTICS TUBE WINDOW.

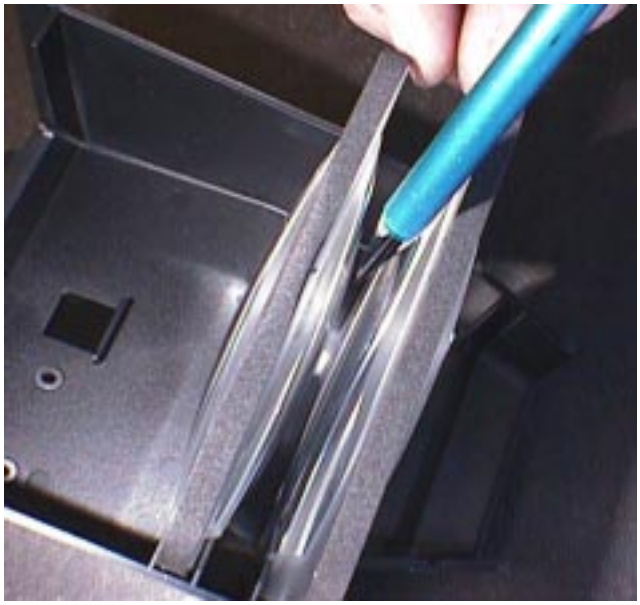
NOTE:Since replacement lenses and window may have slightly different light transmittance characteristics , it is important to perform Factory Calibration.

4.25.1 Assure that all lenses have foam tape on edges. See Drawing#112000.

4.25.2 Clean housings with air.

NOTE:SEE PHOTO AT RIGHT. Be careful to leave one space between the lenses when inserting them into the housings. If put into two adjacent grooves, they will scratch eachother when inserting the second one.

4.25.3 Put lenses and optics tube window into one optics tube.



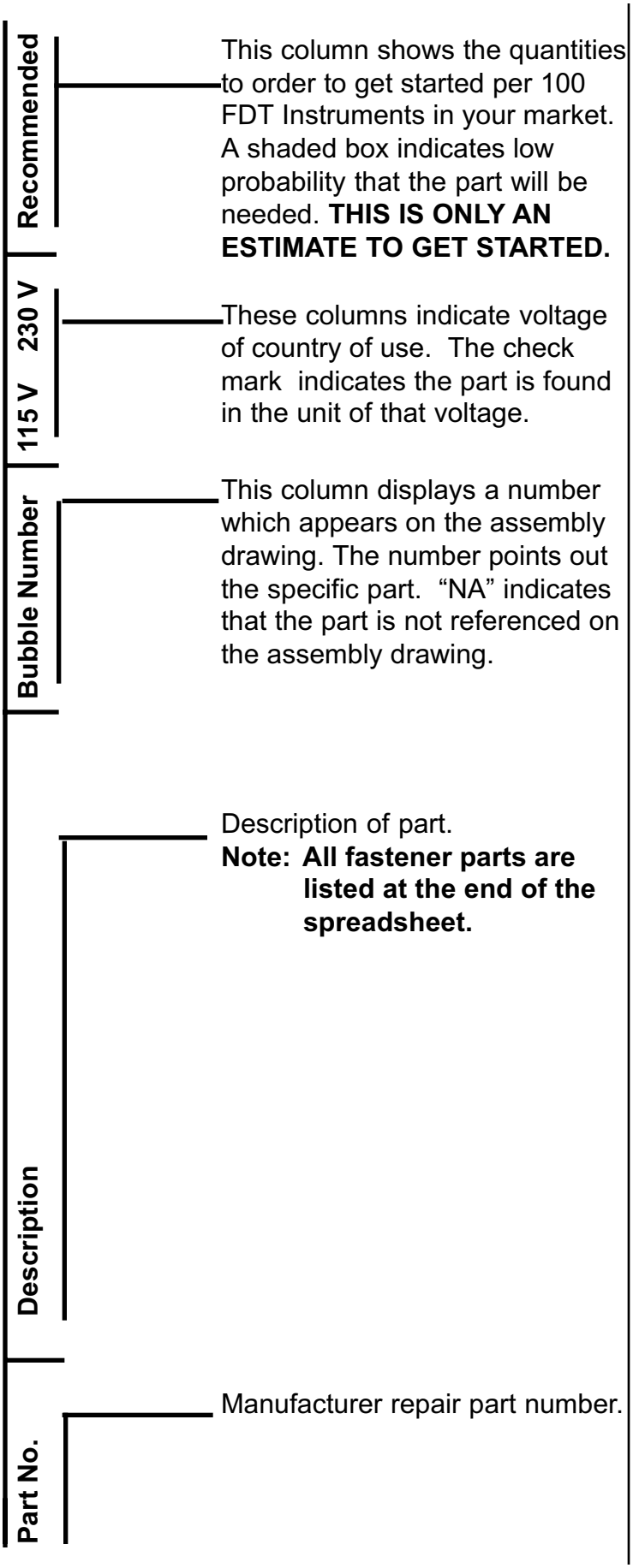
4.25.4 Assemble housings together.
a)Slide other optics tube over lenses.
b)Replace screws.

4.25.5 Reassemble optics (Sect. 4.4)

4.25.6 If any combination of new lenses and/or optics tube window have been installed, perform factory calibration.

Interconnect Diagram
112119 Rev B
(2 sheets)

Key to Repair Parts List



This column shows the quantities to order to get started per 100 FDT Instruments in your market. A shaded box indicates low probability that the part will be needed. **THIS IS ONLY AN ESTIMATE TO GET STARTED.**

These columns indicate voltage of country of use. The check mark indicates the part is found in the unit of that voltage.

This column displays a number which appears on the assembly drawing. The number points out the specific part. “NA” indicates that the part is not referenced on the assembly drawing.

Description of part.
Note: All fastener parts are listed at the end of the spreadsheet.

Manufacturer repair part number.

Part No.	Description	Bubble Number	115V	230V	
M11526	ANTISTATIC POLY BAG(30X36)PINK	N/A	x	x	
112050-502	PRB ASSEMBLY (BLACK)	N/A	x	x	10
112065-2	LABEL, PRB MODEL	N/A	x	x	
112098	FDT - USER'S GUIDE, ENGLISH	N/A	x	x	2
112098C	OPERATING INSTRUCTIONS,	N/A	x		2
112098FR	FDT USER'S GUIDE, FRENCH	N/A		x	2
112098GR	FDT USER'S GUIDE, GERMAN	N/A		x	2
112098IT	FDT USER'S GUIDE, ITALIAN	N/A		x	2
112098SP	FDT USER'S GUIDE, SPANISH	N/A		x	2
112113-504	BOX ASSEMBLY	N/A	x	x	1
112131	DESICCANT BAG	N/A	x	x	
112132	FDT, REGISTRATION CARD,ENGLISH	N/A	x	x	
112136	FDT - QUICK REFERENCE,ENGLISH	N/A	x	x	20
761076-0	POWER CORD, DETACH.(DOM/JAPAN)	N/A	x		2
761076-2	POWER CORD, DETACH. (EUROPEAN)	N/A		x	2
761076-4	POWER CORD, DETACH. (UK)	N/A		x	2
761076-6	POWER CORD, DETACH. (AUSTRALIA)	N/A		x	2
112120	REPAIR MANUAL	N/A	x	x	1
112002-1	BASE PLATE ASSY	0001	x		
112002-2	BASE PLATE ASSY	0001		x	
112101-1	PRB, WIRE ASSY	0002	x		1
112143-2	PRB, WIRE ASSY	0002		x	1
112075	WIRECLIP	0003	x	x	
112006-1	TRANSFORMER (120V/230V ISOLAT)	0004	x		2
112006-2	TRANSFORMER	0004		x	2
112005	POWER ENTRY MODULE	0006	x	x	2
112085-1	WIRE ASSY, 4.25	0007	x	x	1
488383	GROUND LABEL	0008	x	x	
112064-2	LABEL, FUSE/READ MANUAL	0009	x	x	
112003-2	HOUSING,BASE	0010	x	x	1
112004-2	FOOT, RUBBER (BLACK)	0011	x	x	4
112057-4	LABEL,MODEL DOMESTIC	0013	x		2
112057-3	LABEL,MODEL INTL	0013		x	2
M11478	PARTS LABEL	0014	x	x	1
112067-1	LABEL, CONNECTOR ID	0015	x	x	2
112007-1	VISOR	0016	x	x	1
236174-1	BATTERY COVER PAD	0017	x	x	1
112010-1	BROWREST	0018	x	x	10
112008-1	OPTICS TUBE	0019	x	x	
112076-501	PCB ASSY, LIGHT METER	0020	x		2
112141-502	PCB ASSY, LIGHT METER	0020		x	2
112013	LENS, ACRYLIC	0022	x	x	2
112110-2	FOAM TAPE, LENS	0023	x	x	4
112011-1	WINDOW, OPTICS TUBE	0024	x	x	2
112110-1	FOAM TAPE OPTICS TUBE WINDOW	0025	x	x	4
112056	MONITOR GASKET	0027	x	x	10
112025-505	HOUSING,REAR, PRINTED	0029	x		1
112025-505R	HOUSING,REAR, PRINTED	0029		x	1
112043-1	LCD ESD SHIELD	0030	x		1
112145	LCD ESD SHIELD	0030		x	1
112042-1	WINDOW,LCD	0031	x	x	5
112092-1	LCD BUTTONS	0032	x	x	1

Part No.	Description	Bubble Number	115V	230V	Recommended
112091-1T	LCD MODULE	0033	x		1
112091-2	LCD MODULE	0033		x	1
106103-43	MYLAR WASHER	0034	x	x	6
112041-502	MONITOR ASSY	0035	x		1
112041-503	MONITOR ASSY	0035		x	1
112037-504	PCB ASSY,MCU	0036	x	x	1
112086	CONNECTOR, PCB TO PCB	0037	x	x	4
112105-2	FRONT ESD SHIELD	0040	x	x	
112026	PRINTER SHELF W/ PEMS	0042	x		
112124-1	EDGE PROTECTOR	0043	x	x	
112017	THERMAL PRINTER, 2	0044	x	x	2
112044-1	RIBBON CABLE ASSY, PRN (26PSN)	0046	x	x	1
112074	LABEL, OPTICS TUBE	0047	x	x	2
112072-2	FRONT HSG BACKPLATE W/ PEMS	0048	x	x	1
112085-2	WIRE ASSY,10.5	0049	x	x	2
112033-1	GUIDE, VISOR	0052	x	x	5
112079-501	PCB ASSY, VPS	0053	x		1
112142-501	PCB ASSY, VPS	0053		x	1
112049-3	HOUSING, FRONT LEFT	0055	x	x	1
112048-3	HOUSING, FRONT RIGHT	0057	x	x	1
106144-5	NYLINER BEARING	0059	x	x	2
112031-1	SLIDE BRACKET	0060	x	x	1
112018	SPRING VISOR	0062	x	x	5
112081	VISOR WEAR PAD	0063	x	x	5
112082-2	ROD, FINISHED	0064	x	x	1
112061-1	LABEL, VPS REFLECTIVE	0065	x	x	1
112039-1	VISOR BACKPLATE ASSY	0066	x	x	
112094	FLEX CABLE W/ RINGS	0068	x	x	1
112124-3	EDGE PROTECTOR	0070	x		1
112077	RIBBON CABLE CLAMP	0071	x		1
112077-2	CABLE CLAMP	0071		x	1
112080-4	EDGE PROTECTOR,U CHANNEL 3.14	0072	x	x	2
112063	UPPER SHELF W/ PEMS	0073	x		
112046-2	HOUSING, REAR RIGHT	0074	x	x	1
112044-2	LCD CABLE ASSY (40PSN)	0075	x		1
112124-2	EDGE PROTECTOR, 4	0076	x		2
112047-2	HOUSING, REAR LEFT	0077	x	x	1
112068-2	LABEL, PAPER LOADING INSTR	0079	x	x	
112027-4	HSG, PAPER DOOR,PRINTED	0080	x	x	1
112019	THERMAL PAPER ROLL, 2	0081	x	x	60
112024-4	HSG,FRONT COVER,PRINTED	0083	x	x	1
112129-1	LABEL, FRONT COVER LOGO G	0085	x	x	1
106138-6	SCREW, BUTTON HS SOCKET G	0086	x	x	10
112066	LABEL, BACKGRND DEBUG CONN	0088	x	x	10
112078-1	CALIBRATION CAP	0090		x	20
106127-1	STANDOFF-SCREW MOUNT	0095	x	x	4
112121	CLIP	0096	x	x	20
112122	EMI SHIELD, REAR	0098	x	x	1
112155	EMI SHELD, CRT	0098	x		1
112130	FOAM, PAPER ROLL	0099	x	x	60
236706-3109	FUSE, 160 MA	0100		x	20
236706-3112	FUSE- 315 MA	0100	x		20

Part No.	Description	Bubble Number	115V	230V	Recommended
112140-1	JUMPER ASSY RS232	0103		X	1
112133-1	FRONT EMI SHIELD	0104		X	
112135	PRINTER ENCLOSURE	0108		X	
112147	PRINTER GASKET	0109		X	1
112151	COPPER TAPE	0110		X	1
112149	FOAM, BLOCK	0111		X	1
112137	BASE SHIELD	0112		X	
112146	TOP EMI SHIELD	0113		X	
112150	FOAM, STRIP	0114		X	2
112148	PRINTER ENCLOSURE GASKET	0115		X	1
112138-501	SHIELDED RIBBON CABLE ASSY	0116		X	1
761077-1	TIE WRAP	0117		X	
106137-2	NUT,8-32 EXTLOCK	0005	X	X	12
106100-51	PHPS 8-32 X .750	0012	X	X	12
106124-4	#4 X.250 LG PPHS SELF TPG	0021	X	X	12
106124-30	SCREW #6 X .375	0026	X	X	12
106105-3	#4 LOCKWASHER,HEL	0038	X	X	12
106100-42	4-40 X.25 SCREW	0039	X	X	12
106100-12	PHPS 8-32 X.281	0041	X	X	12
711776	SCREW,M3 PHPS METRIC	0045	X	X	12
745147	#6 LOCKWASHER-EXTERNAL TOOTH	0050	X	X	12
106100-50	6-32 X .125 PHILLIPS,STL	0051	X	X	12
106124-31	#4 X.250 LG PPHS SELF TPG	0054	X	X	12
106102-27	FHPHPS 6X32X.250 LG	0056	X	X	12
483017	PHPS 6-32 X 5/16	0061	X	X	12
106140-5	6-32 W/EXT WASHER	0067	X	X	12
106140-9	8-32 W/EXT WASHER	0069	X	X	12
106124-36	SCREW .500 AB PAN PHILLIPS	0078	X	X	12
106119-34	.344 HEX SOCKET ST BLACK ANODI	0089	X	X	12
106137-7	NUT 6-32 EXTLOCK	0094	X	X	12
106100-52	PHPS 8-32 X .500	0097	X	X	12
106103-6	WASHER, FLAT	0106		X	

FDT Assemby Drawings:

112000 Domestic
sh1 Rev D
sh2 Rev D
sh3 Rev D

112200 International
sh1 Rev B
sh2 Rev A
sh3 Rev B
sh4 Rev B

Schematics

112106
Schematic, Controller PCB, Patt C
sh1 Rev D
sh2 Rev D

112091
Schematic, LCD Module Custom Circuitry
sh3 Rev C

112037
PCB Assembly, MCU
Rev D

10,000 VOLTS

CAUTION

EXERCISE EXTREME CAUTION WHEN SERVICING THE FDT!

THE MONITOR ASSEMBLY OPERATES ON APPROXIMATELY 10,000 VOLTS!

NOTE: Properly re-install all ESD shields and ground wires to maintain EMI protection standards!

9.1 REMOVAL OF REAR HOUSING/LCD

9.1.1 Lower paper door.

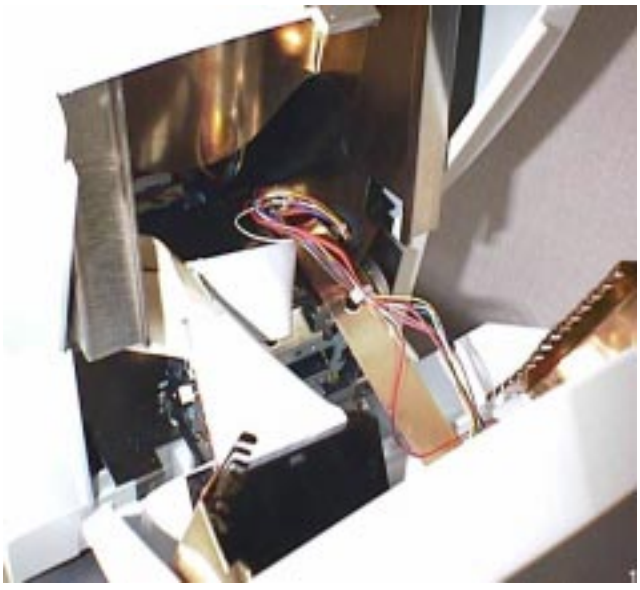
9.1.2 Remove paper:
a) pull lever down
b) pull paper out

Caution: It is essential that you use proper ElectroStatic Discharge (ESD) precautions when disassembling or handling the instrument circuitry or printed circuit boards (PCB,s). Many components in the instrument such as the MCU/PCB, are highly susceptible to static discharge damage. Put PCB,s in ESD bags when they are removed from the FDT.

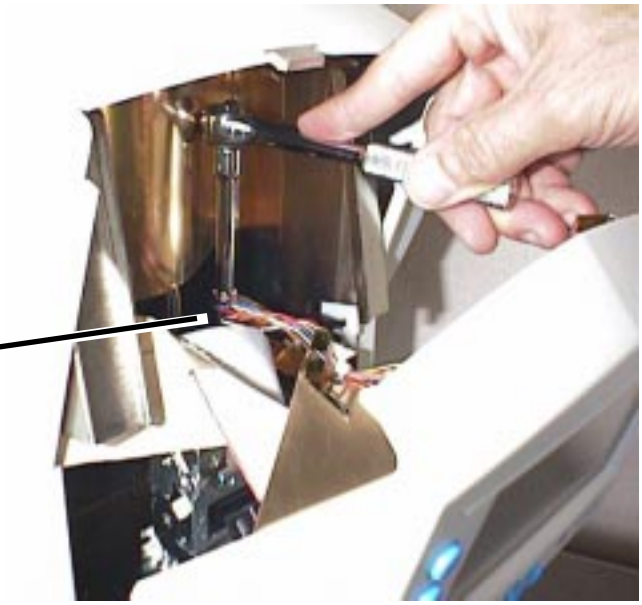
9.1.3 Remove 4 screws from rear housing.

9.1.4 Lower rear housing/LCD assembly .

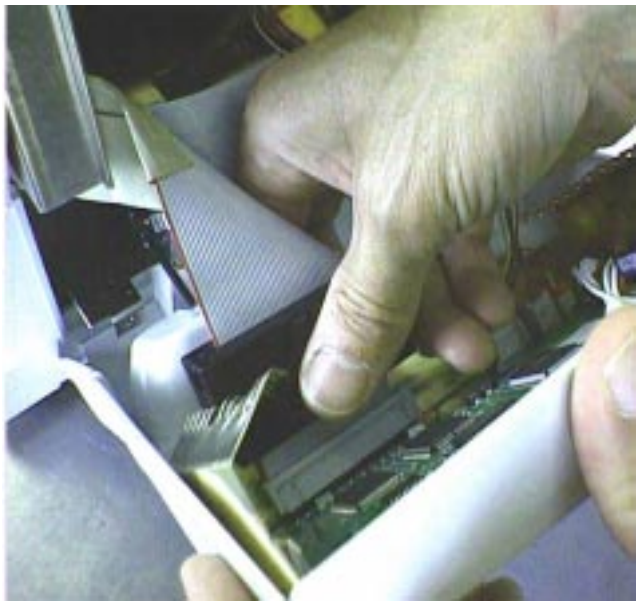
Copper ESD shields may have sharp edges. **Exercise caution to avoid cuts!**



9.1.5 Disconnect LCD ESD shield from top of printer enclosure. Remove nut with 11/32" socket.



9.1.6 Disconnect wiring from LCD board:
a) Pull Printer Ribbon Cable connector J1 from LCD printed circuit board.



9.1.6 Disconnect wiring from LCD board:
b)Disconnect 3 connectors (shown from left to right) Stepper Motor Connector P3, Paper Out Connector P2, and Head Up Connector P1.

9.1.7 Cut cable tie shown by arrow in photo. and place rear housing/LCD sub assembly into a clean anit-static bag for temporary storage.

9.1.8 Remove paper door.

9.2 REPLACEMENT OF REAR HOUSING/LCD ASSEMBLY

9.2.1 Reassemble in reverse order with following notes:

a) Push Keyed ribbon cable into connector J1 of the LCD module.

b) Secure P1, P2, P3 wires to the LCD shield ground strap with a wire tie.

c) Restore P1, P2, and P3 connections to the LCD module.

d) Ensure that the LCD ESD ground shield stays on the inside of the rear housing as rear housing/LCD sub assembly is closed. See photo.

9.2.2 Plug unit in and turn on

9.2.3 Replace paper roll per instructions in user's manual.

9.2.4 Close paper door.

NOTE: Factory calibration is not required when replacing the LCD module assembly.

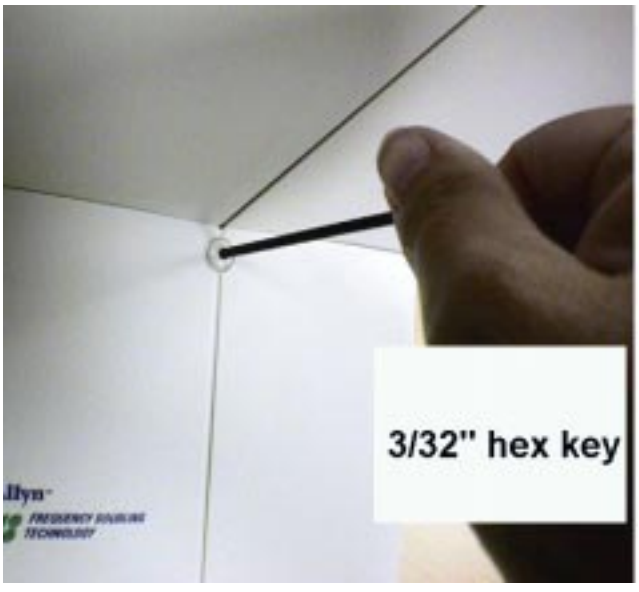
9.3 DISASSEMBLY OF OPTICS

9.3.1 Remove rear housing/LCD sub assembly. **(Refer to 9.1)**

9.3.2 Remove front housing:

a) Remove screw from front housing Use a 3/32" hex key.

b) Pull front housing out



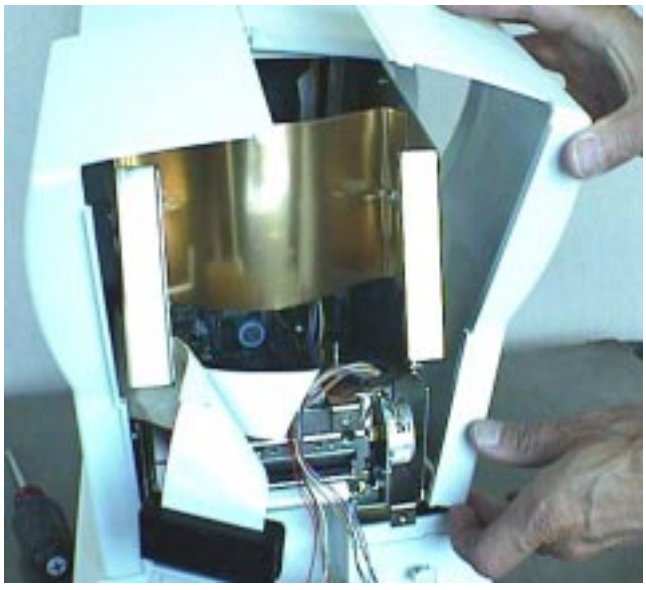
9.3.3 Remove left and right rear housings:
a) Pull clip from top of housings.

Note: Use a screwdriver with a magnetized tip to prevent screw from falling into unit in step (b) below.

b) Remove screw from inside of housings.

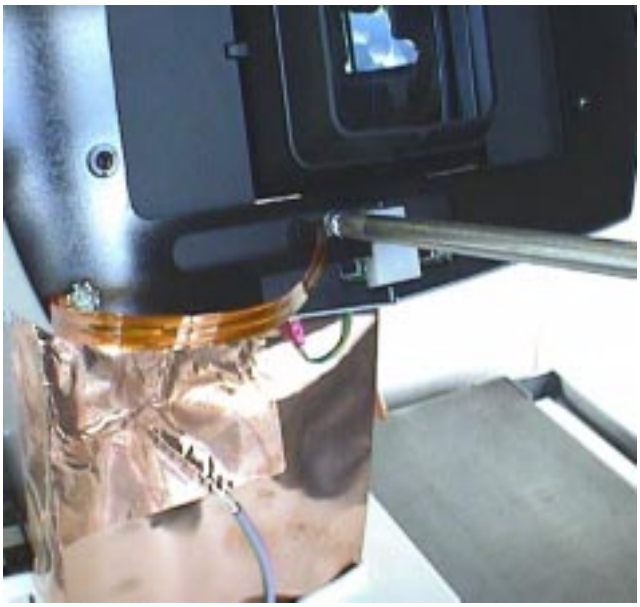
9.3.3 Remove left and right rear housings:
c) Remove 2 screws that connect each housing to chassis.

9.3.3 Remove left and right rear housings:
d)Pull housing up and out of base assembly

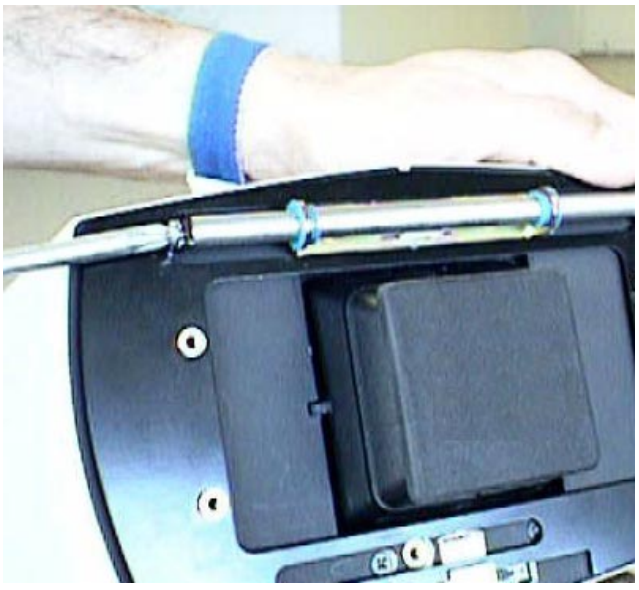


9.3.4 Remove visor/browrest assembly:
a) Unscrew 4 set screws (7/64” key)
b) Pull visor/browrest assembly off.

9.3.5 Remove screw and lockwasher from right side of ground cable.

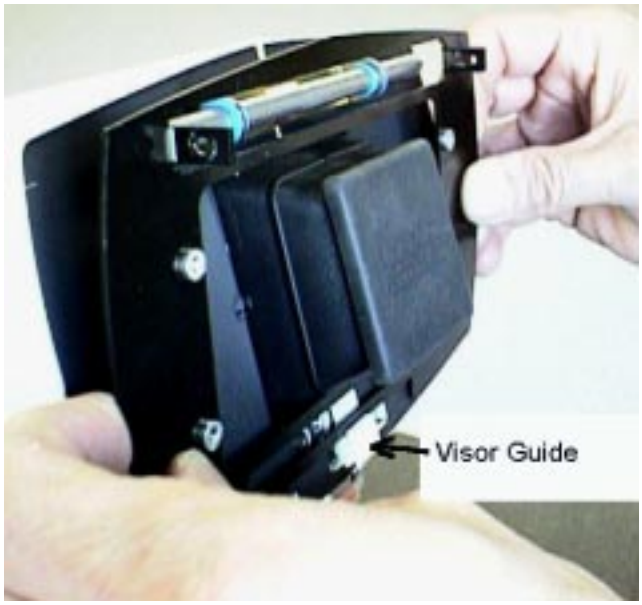


9.3.6 Remove slide/bracket/ rod assembly:
a)Remove screws and lock washers from both ends of the slide rod.



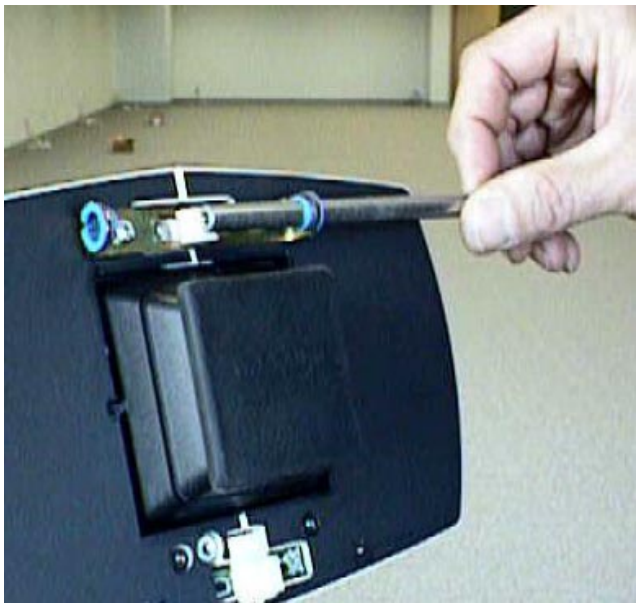
9.3.6 Remove slide/bracket/ rod assembly:
b)Remove visor backplate from visor guide by lifting out from top, then up.

Caution: Improper removal of the visor backplate may damage the visor guide (see arrow in photo). Carefully lift the visor backplate away from the unit. Do not pull it away.



9.3.6 Remove slide/bracket/ rod assembly:
c)Remove rod from slide-bracket.

Note: Place finger on visor wear pad to prevent it from falling.

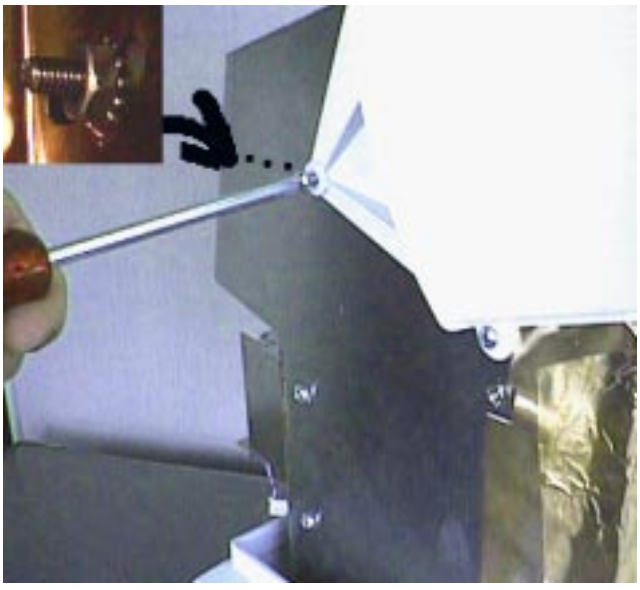


9.3.6 Remove slide/bracket/ rod assembly:
d)Remove visor wear-pad and visor spring bracket.

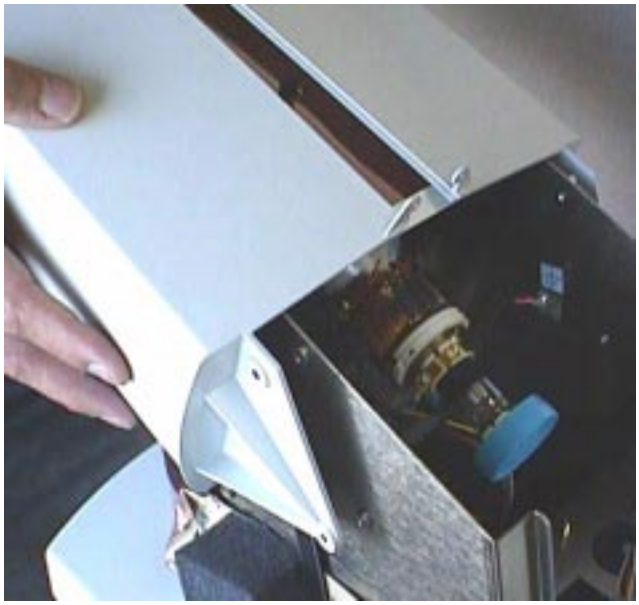
9.3.6 Remove slide/bracket/ rod assembly:
e)Remove 2 screws.
f)Remove bracket.

9.3.7 Remove front left and front right housings:
a)Remove two black screws from front of housings.

9.3.7 Remove front left and front right housings:
b)Remove the nut and center screw from each housing.
Nut also holds EMI shield (Inset).
Use 11/32" wrench or socket.
c)Remove 2 remaining screws from front left and front right housings.



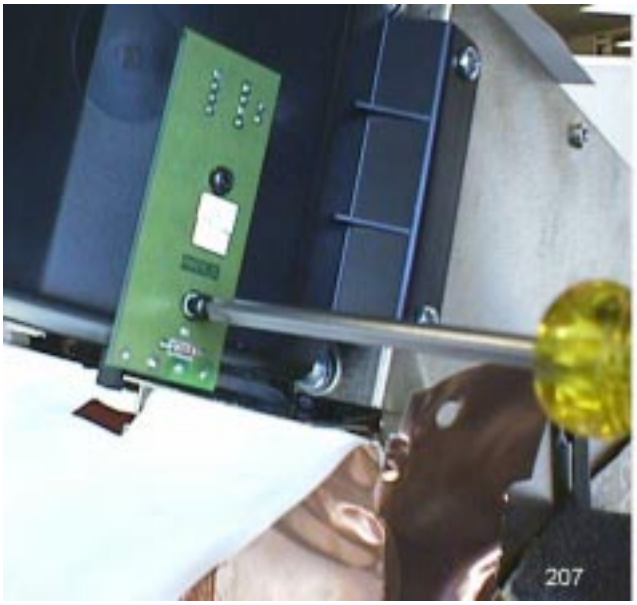
9.3.7 Remove front left and front right housings:
d)Spread and lift housings from base.



9.3.8 Lift front housing backplate from optics tube assembly.

9.3.9 Remove shields:
a)Remove top shield.(photo).
b)Push bottom shield down and away from optics tube assembly.

9.3.10 Remove Internal Photodetector (IP).



9.3.11 Remove optics tube assembly:
a)Remove 4 screws while supporting optics tube assembly.

9.3.11 Remove optics tube assembly:
b)Remove optics tube assembly.
c)Put optics tube assembly into a dust-free bag for storage.

d)If necessary, remove foam gasket carefully.

9.4 ASSEMBLY OF OPTICS

9.4.1 Replace the optics tube assembly:
a)Place foam gasket into position.

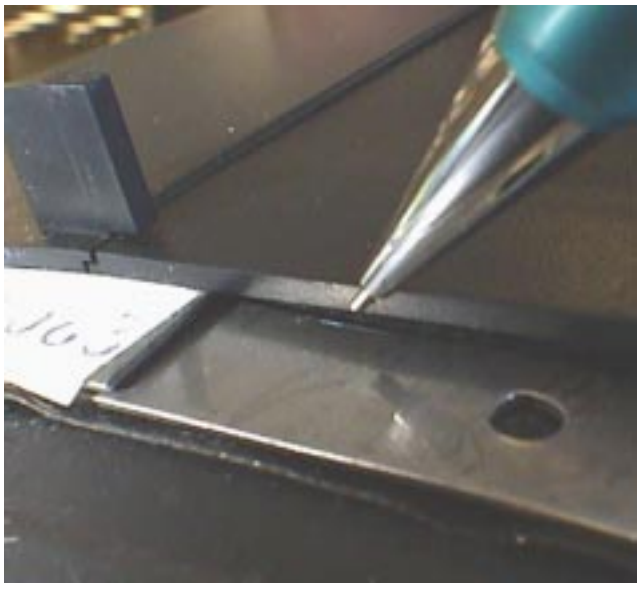
Note: Notches on left and right sides of foam gasket must fit over the tabs.

9.4.1 Replace the optics tube assembly:
b)Hold the optics tube assembly with the Internal Photodetector (IP) window on the right side.

c)Position the optics tube assembly onto the Monitor/Chassis assembly until the slotted holes are in the position shown in the photo at right.

9.4.2 Secure Optics Tube and Internal Photodetector (IP).
a) Check to make sure optics tube assembly is on top of the CRT metal band and secure it with 4 screws.
b) Make sure IP chip surface is clean and attach IP/PCB to optics tube assembly with 2 screws.

NOTE: Use very slight torque to tighten 2 IP/PCB screws.



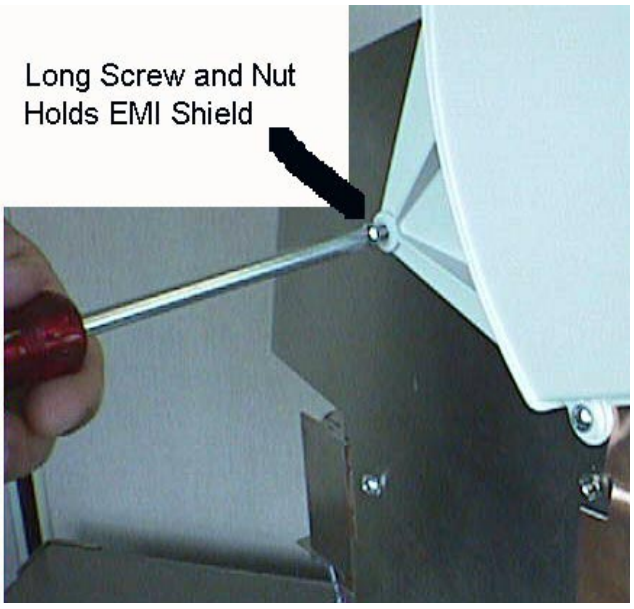
9.4.3 Restore top and bottom ESD shields on the optical tube assembly.

9.4.4 Position the front housing backplate onto the optics tube assembly.

9.4.5 Replace front left and right housings:
a)Position housings onto chassis.

Note: make sure shielded cables do not get caught between housings under optics tube assembly. Smooth operation of the visor depends on proper alignment of housings with the optics tube assembly. Assemble and align the notches in the housings with the optics tube assembly as shown in the photo at right.

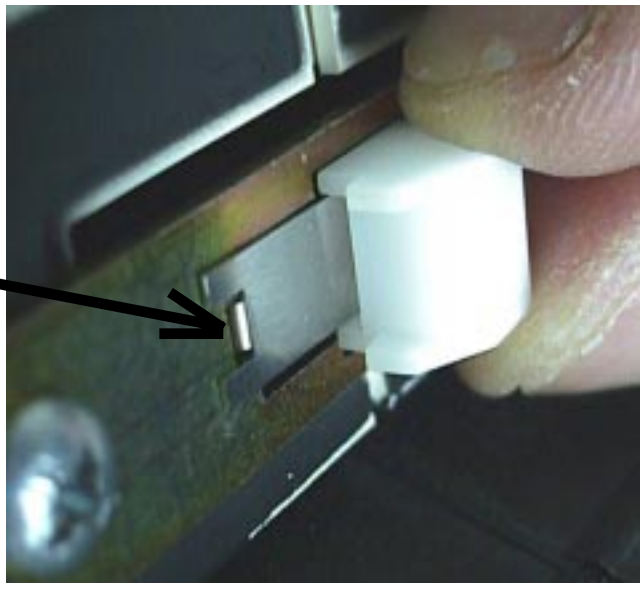
9.4.5 Replace front left and right housings:
b)Install slide/bracket rod assembly . See 9.3.6)
c)Install 2 black screws into front housings.(See 9.3.7)
d)Fasten left and right housings with 3 screws each. Use the long screw where shown in photo at right.



9.4.6 Install Rear EMI shield:
a)Shield must contact but not move BLUE CAP of CRT. Put shield over screws. Use 11/32” wrench or socket.

9.4.7 Install Rod into slide bracket:
a)Put visor spring and visor wear pad into position.

Note: small metal tabs at end of spring face toward unit.

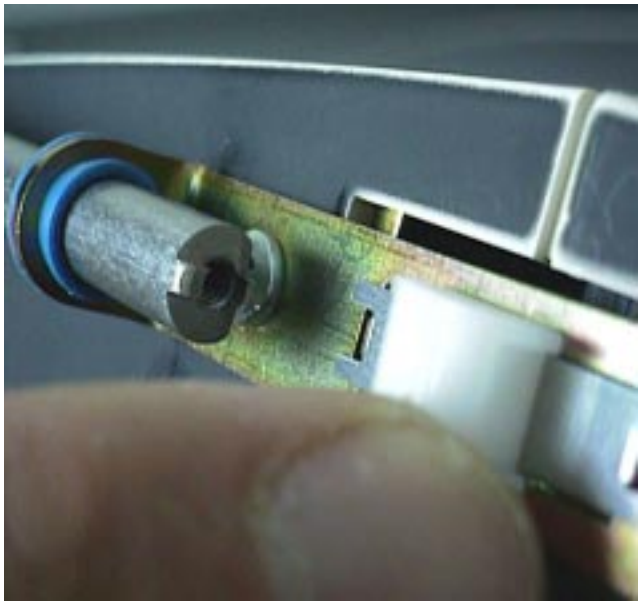


9.4.7 Install Rod into slide bracket:

b)Hold wear pad in place and slide the rod (as shown in photo) in from the left side of bracket.

c)Test this assembly by sliding the rod left and right. **The rod must engage the detent at each end of the stroke.**

d)Put rod in center position.



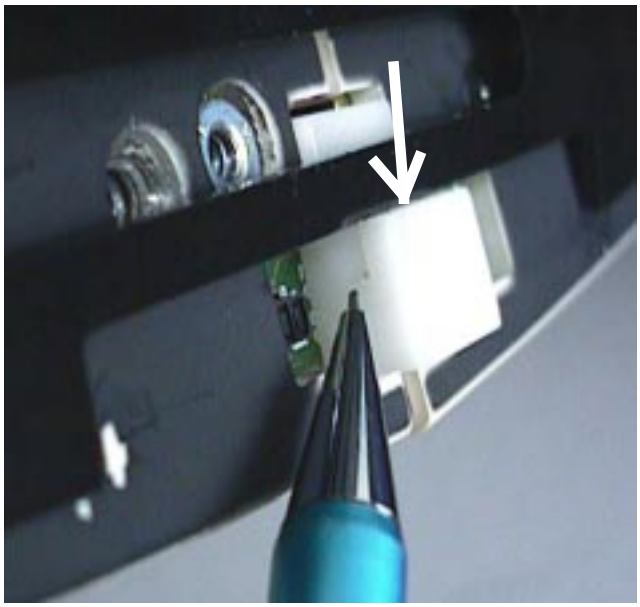
9.4.8 Install visor backplate:

a)Put visor backplate into notch in visor guide as shown in photo.

b)Put visor backplate over the slide bracket/rod assembly. (See 9.3.6 b)

c)Attach visor backplate to rod with screws and lockwashers. (See 9.3.6 a)

d)Restore ground cable connection with screw and External tooth lockwasher. (See 9.3.5)



9.4.9 Install visor/browrest sub assembly:

a)Slide the visor backplate to right.

b)Put visor/browrest onto visor backplate **with ground cable in position shown in photo.**

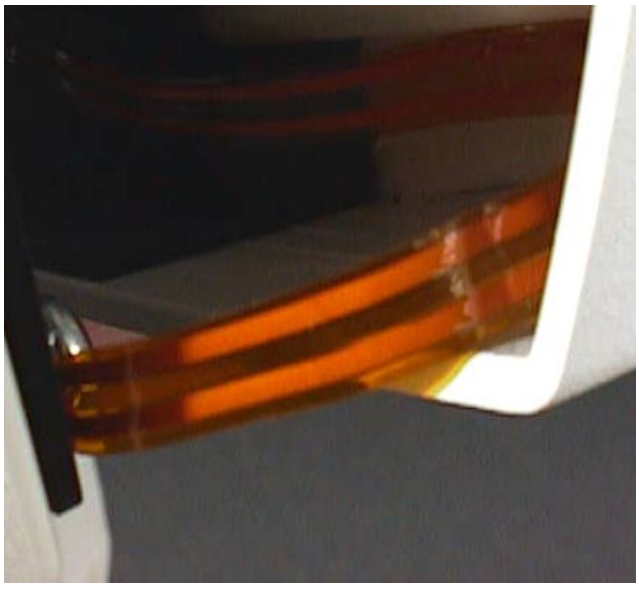
c)Secure with 4 set screws.

d)Test this assembly by sliding left and right. **The Visor must:**

1)move smoothly

2)click (detent) at end of stroke.

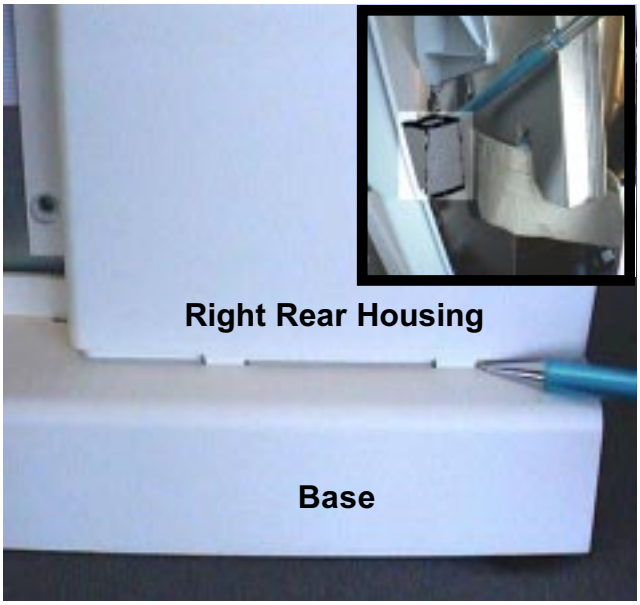
3)not rub the ground cable.



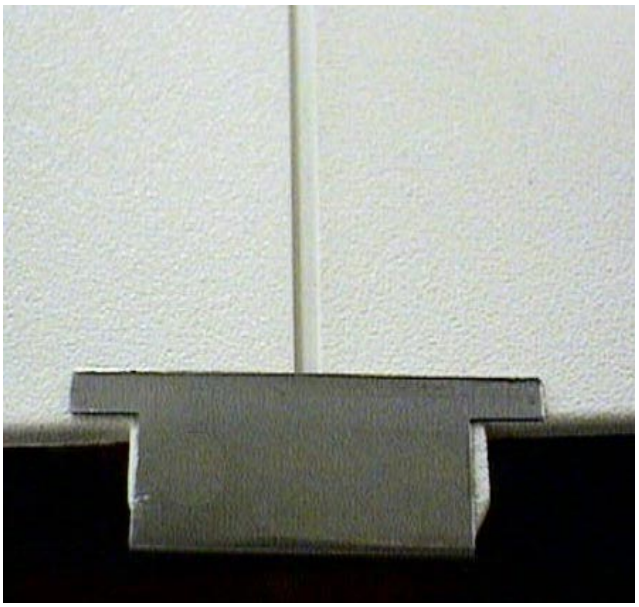
9.4.10 Install left and right rear housings:
a)Put side housing bottom tabs into slots in base.

Note: See photo inset for foam block reference. Make sure foam block is in place before installing rear right housing .

b)Secure each cover with 2 screws (See 9.3.3 c)
c)Fasten covers inside upper section with one screw(See 9.3.3 b)



9.4.10 Install left and right rear housings:
d)Put clip on covers.



9.4.11 Install front housing:
a)Align tabs of front housing with slots in base and secure with one central screw. (See 9.3.2 a)

9.4.12 Install rear housing/LCD assembly:
a)Follow instructions in Section 9.2

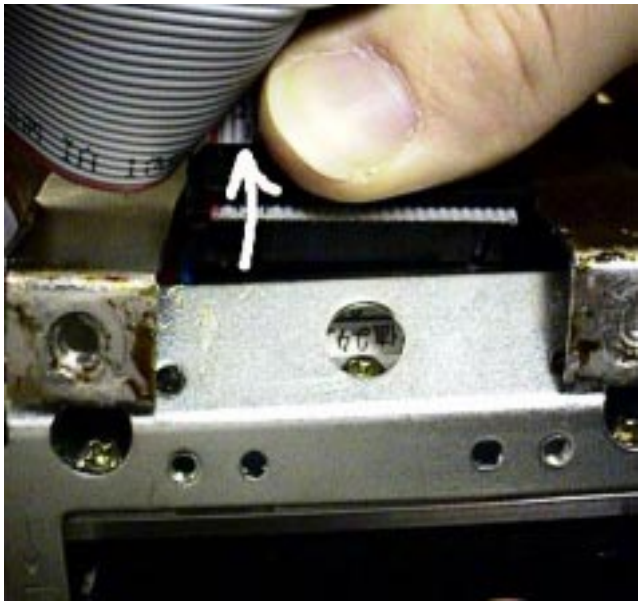
NOTE: If a new Internal Photodetector (IP) was installed, factory calibration is required.

9.5 REMOVAL OF PRINTER

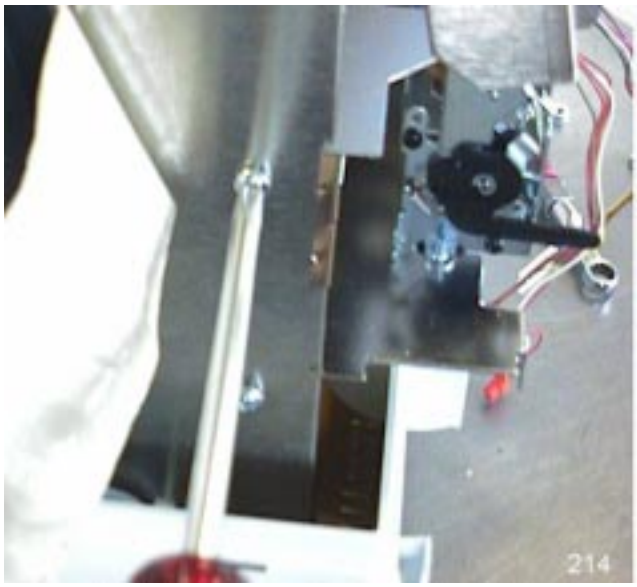
9.5.1 Remove rear housing/LCD assembly (See9.1)

9.5.2 Remove left and right rear housings (See9.3.3)

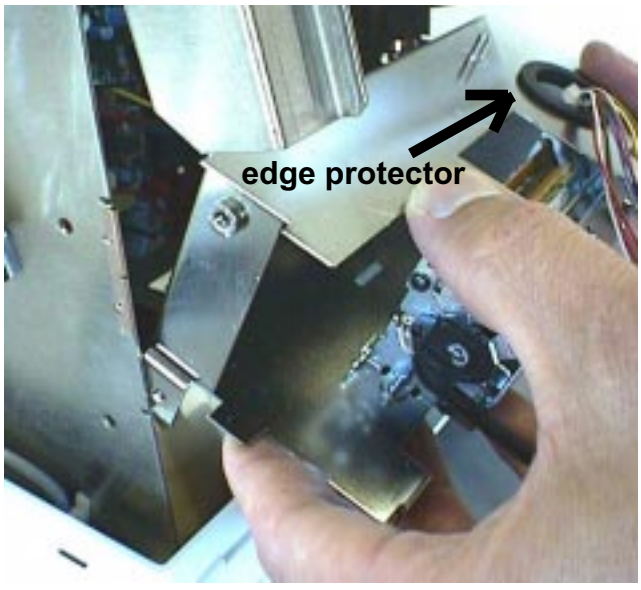
9.5.3 Remove ribbon cable to printer module . (See photo.)



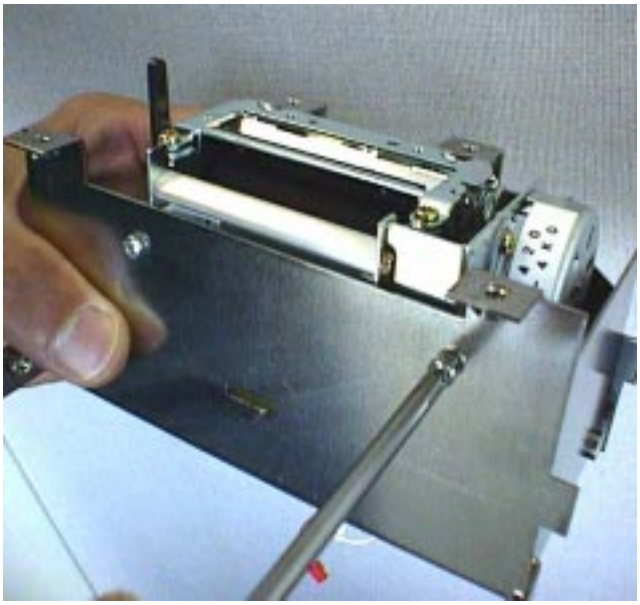
9.5.4 Remove 4 screws (with external tooth washers) which hold printer assembly to chassis.



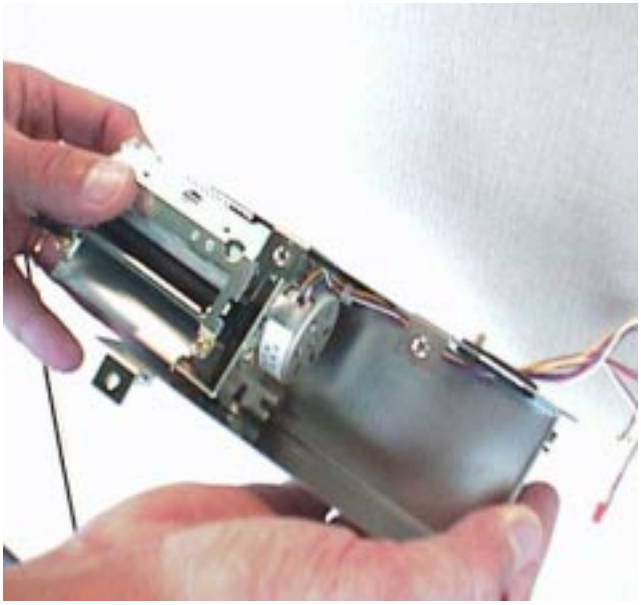
9.5.5 Remove printer assembly from chassis.



9.5.6 Remove printer:
a)Remove 2 screws.



9.5.6 Remove printer:
b) Remove printer from housing.



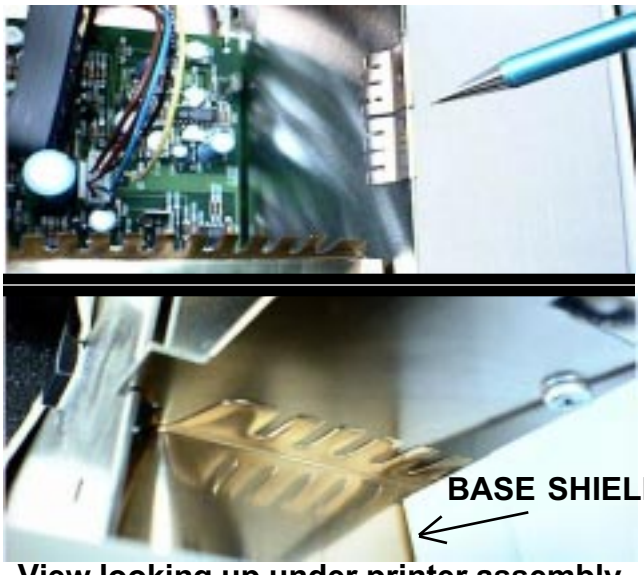
9.6 INSTALLING PRINTER

9.6.1 Reassemble in reverse order of disassembly with special attention to the following Notes.

Note: Make sure copper clips are installed in position shown in upper photo at right. They should snap into small holes in chassis.

Note:Make sure base shield tabs are in position relative to bottom of printer assembly as shown in lower photo at right.

Note: Make sure circular edge protector is installed on printer assembly. (See 9.5.5)



View looking up under printer assembly.

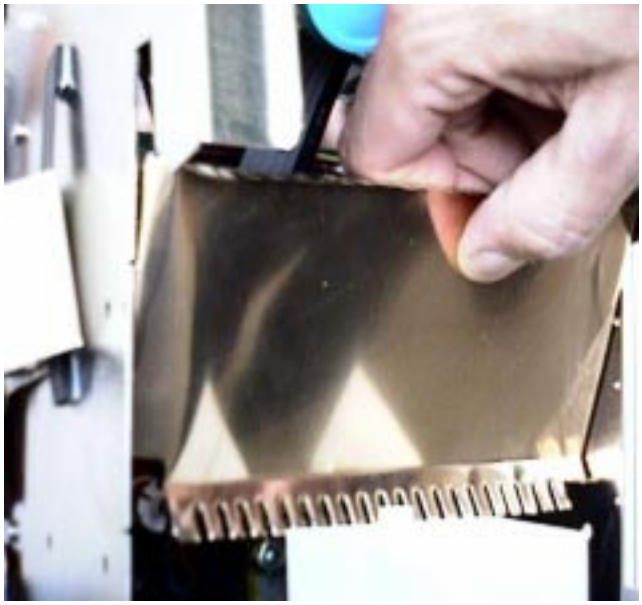
9.7 REMOVAL OF MCU PCB

9.7.1 Remove rear housing/LCD assembly. (See 9.1)

9.7.2 Follow Remove Optics steps 9.3.1 to 9.3.8 (Lift front housing backplate from optics tube assembly.) Do not remove optics tube assembly.

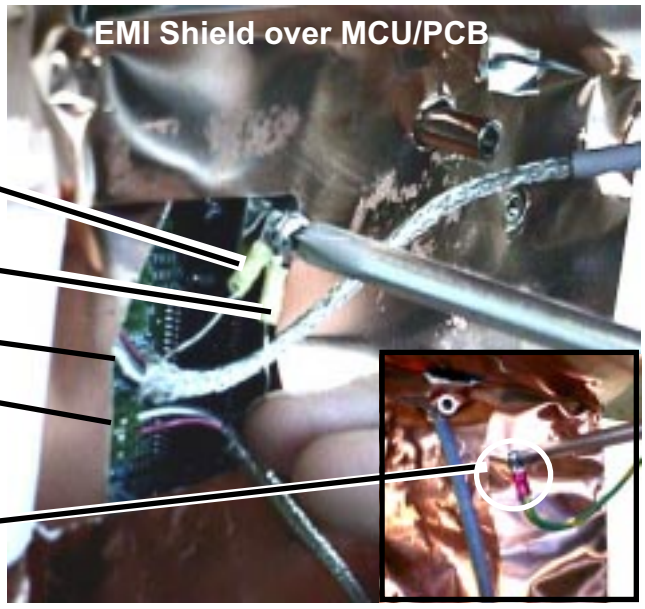
9.7.3 Remove Printer (See 9.5)

9.7.4 Remove base shield.
See photo at right.

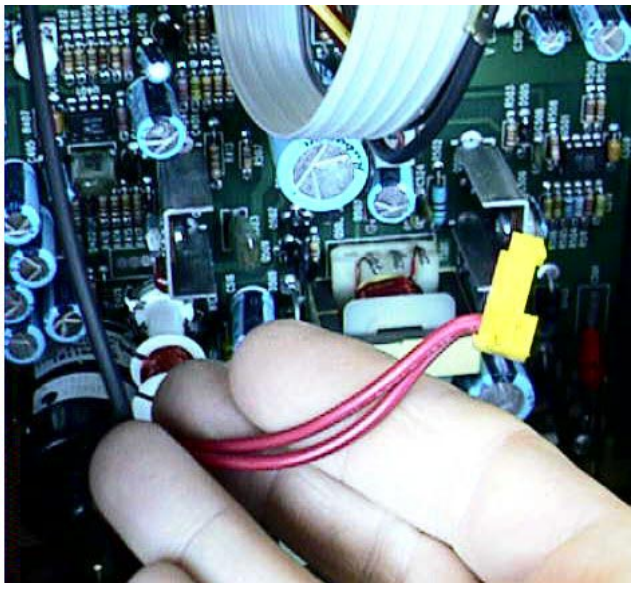


9.7.5 Disconnect wiring:
a)Open flap on front EMI shield foil as shown in Step 9.7.5.
b)Remove Visor Position Sensor PCB (VPS)ground wire ring terminal
c)Remove Patient Response Button (PRB) ground wire ring terminal.
d)Unplug J 107
e)Unplug J105

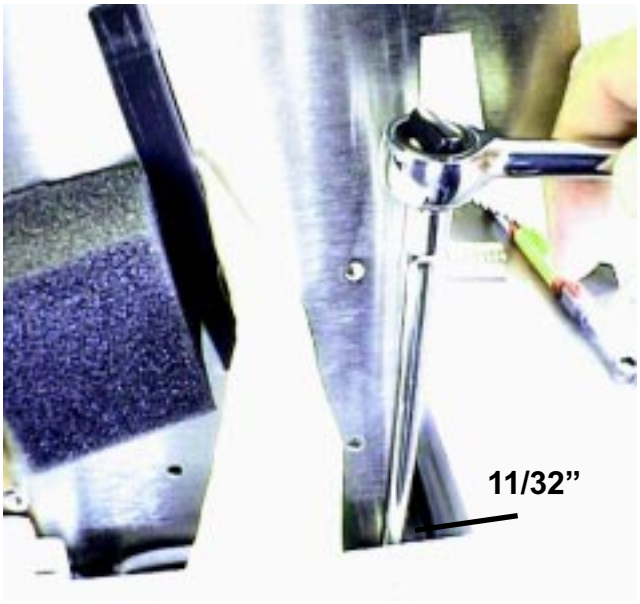
f)Ground wire ring terminal for front housing back plate. See inset.



9.7.5 Disconnect wiring:
d)Unplug P5 from Monitor Board.
e)Disconnect transformer purple wire pair from connector located near transformer.



9.7.4 Remove Chassis/Monitor/MCU assy:
a)Use 11/32” socket and extension to remove 4 nuts holding chassis to the base.

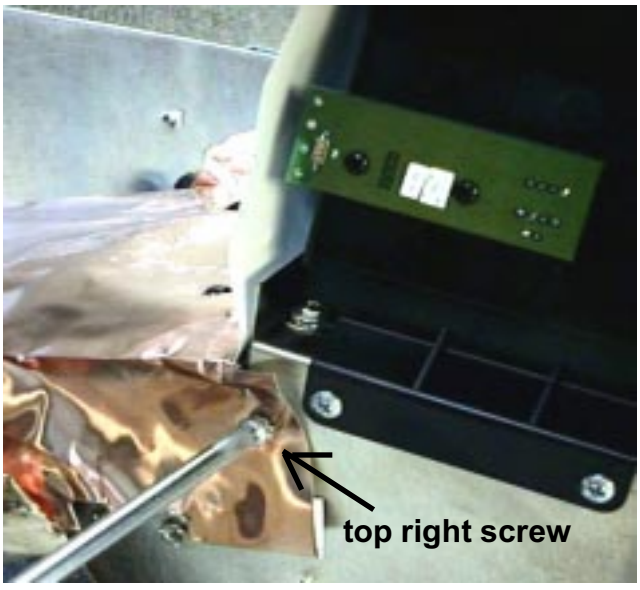


9.7.4 Remove Chassis/Monitor/MCU assy:
b)Tilt chassis/Monitor/MCU assy. forward.

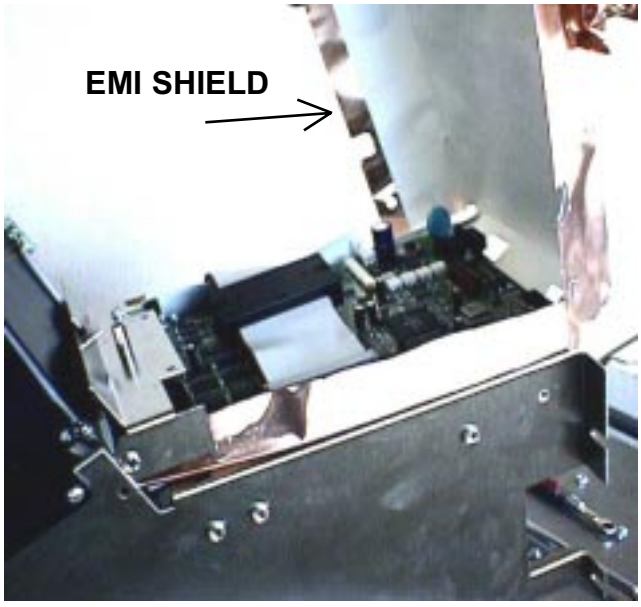
CAUTION:Screw shown in photo will cause difficulty in removing chassis assembly from base. Do not apply force that might press MCU board (under foil) against base.

c)Lift assembly straight up from base and lay on table with copper foil shield facing up.

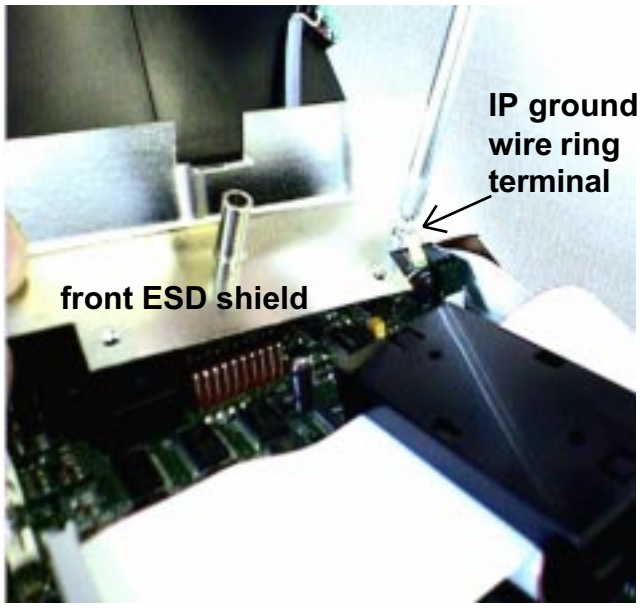
9.7.5 Remove MCU/PCB from Chassis:
a)Remove 4 screws holding shield over MCU/PCB.



9.7.5 Remove MCU/PCB from Chassis:
b)Lift EMI shield up.

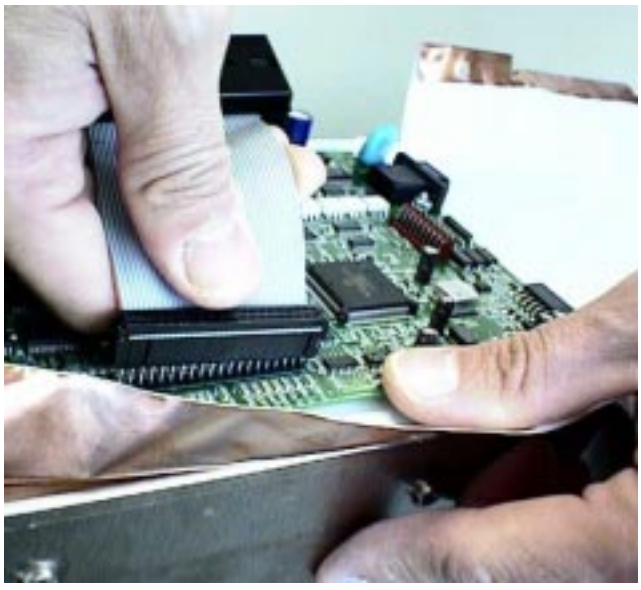


9.7.5 Remove MCU/PCB from Chassis:
c)Remove Internal jPhotodetector (IP) ground wire ring terminal from front ESD shield as shown in photo.
d)Remove front ESD shield.



9.7.5 Remove MCU/PCB from Chassis:
e)Disconnect J7 (shown in photo) and J102 ribbon cable connectors, IP connector J110 and J1.
f)Remove 4 screws with split lockwashers from MCU/PCB.
g)Gently remove MCU/PCB and store in ESD bag .

CAUTION: There are Board to Board pin connectors (J108 and J109)at the top and bottom of the MCU/ PCB. Separate the boards carefully.



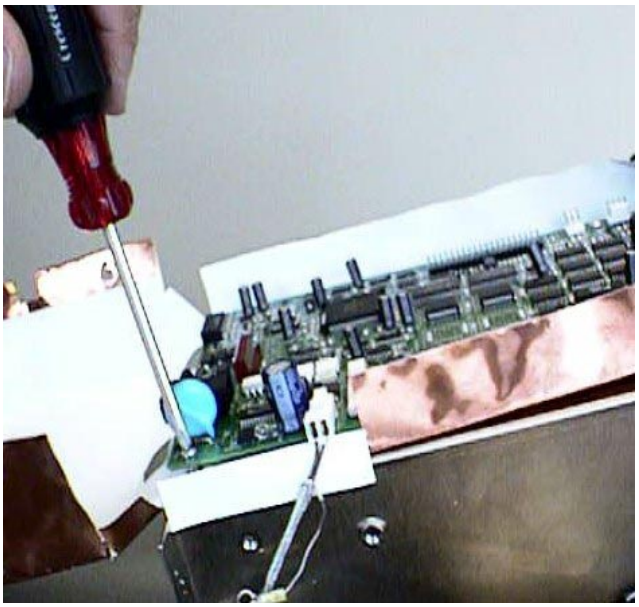
9.8 INSTALLING MCU/PCB

NOTE: Use PC utility to initialize/set NVRAM when installing new MCU/PCB. Factory calibration is also required. See Section 3 pg. 2 for additional information on PC utility.

9.8.1 Install MCU/PCB

a) Insert Connector,PCB to PCB (pn 112086) into top and bottom sockets of new MCU/PCB.

b) Align the pins with the sockets of Monitor Board in chassis and gently press boards together.



9.8.1 Install MCU/PCB

c) Secure with 4 screws.

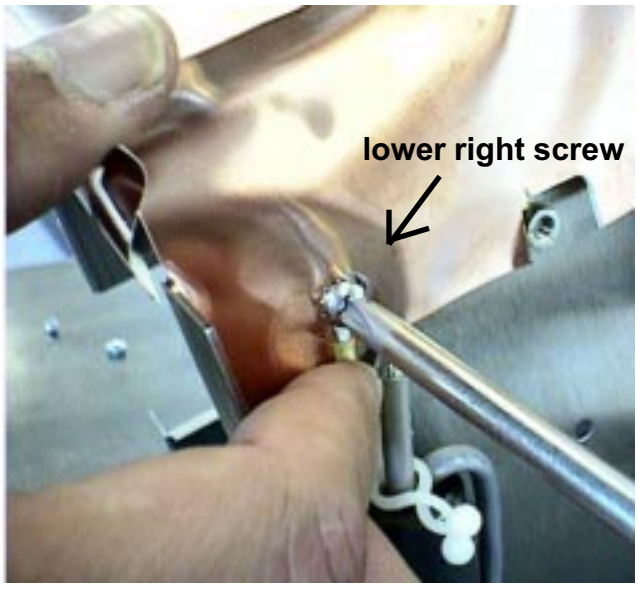
d) Restore connections.

e) Install front ESD shield.

9.8.1 Install MCU/PCB

g) Attach copper EMI shield to chassis with 4 screws.

Note: Make sure to attach ground wire on bottom right side of EMI shield with lower right screw as shown in photo.



9.8.2 Install Chassis/Monitor/MCU assy:
a)**Important:**Make sure wires trans former wires and PRB wires do not get caught under chassis.
b)Tilt the chassis assembly forward. and lower chassis onto studs.
d)Secure the chassis with 4 nuts.

9.8.3 Complete the installation of the MCU/ PCB by following steps 9.7.1 - 9.7.3 in reverse order.

NOTE: Use PC utility to initialize/set NVRAM when installing new MCU/ PCB. Factory calibration is also required. See Section 3 pg. 2 for additional information on PC utility.

9.9 INSTALLING A REPLACEMENT CHASSIS/MONITOR ASSEMBLY

9.9.1 Secure ribbon cable clamps to chassis **over** ribbon cables.

9.9.2 Install MCU/PCB to new chassis.

9.9.3 Reassemble unit. Follow steps 9.7.1 through 9.7.3 in reverse order.

NOTE:The chassis/monitor assembly is a matched set. If either the CRT or the Monitor PCB fails, a new matched chassis/monitor assembly must be installed or the FDT will not function properly. DO NOT ADJUST POTS!

9.9.4 Perform a Factory Calibration **only if** you installed a new Chassis/Monitor.

9.10 REMOVAL OF TRANSFORMER

9.10.1 Remove rear housing/LCD assy. (Sect. 9.1.1 - 9.1.8)

9.10.2 Remove front housing. (Sect. 9.3.2)

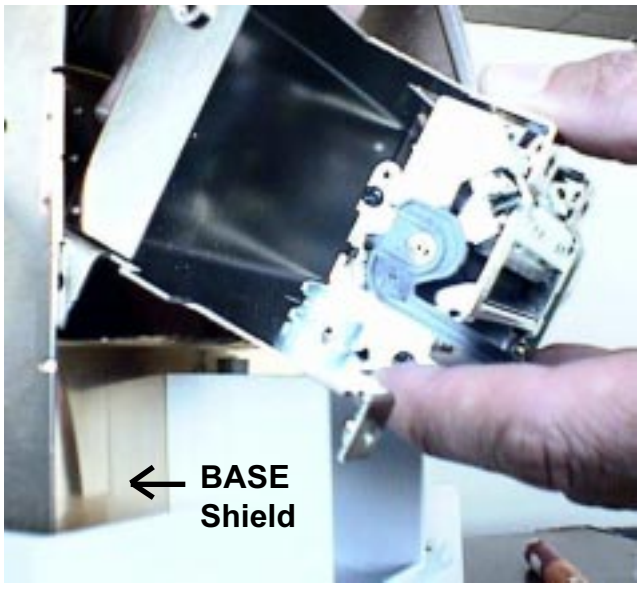
9.10.3 Remove left and right rear housings. and shield by CRT . (Sect 9.3.3)

9.10.4 Remove printer enclosure and shield. See Sect9.5 and photo at right.

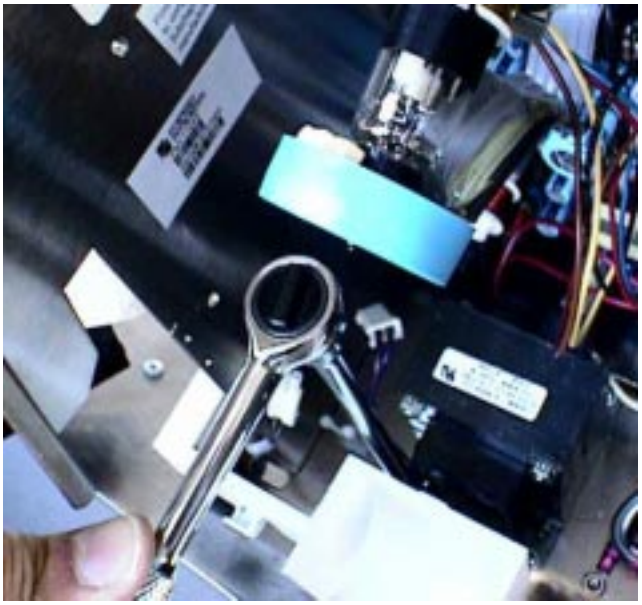
9.10.5 Disconnect J1 and J105 from MCU.

9.10.6 Disconnect P5 from Monitor Board.

9.10.7 Remove Transformer from base.
a)Remove 4 nuts with 11/32” socket.



9.10.7 Remove Transformer:
b)Disconnect transformer wires from power entry module.
c)Lift transformer from base.



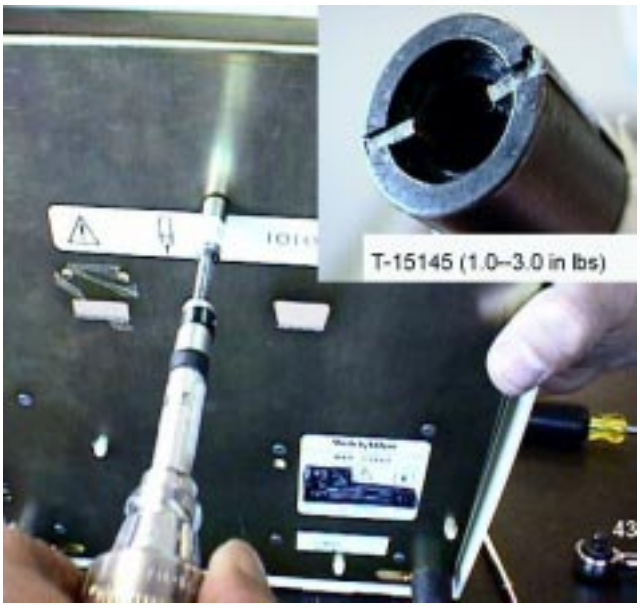
9.11 INSTALLING TRANSFORMER

9.11.1 Install transformer in reverse order of removal.
9.11.2 Restore wiring connections.
a)Refer to Sheet 2 of Drawing #112200 for correct placement of transformer wires to power entry module.

NOTE: Make sure the notch in the copper shield (Bubble No. 112 on drawing 112200 sheet 1 of 4) is on lower left side.

9.12 REMOVAL OF PRB JACK

9.12.1 Remove rear housing/LCD assy. (Sect. 9.1.1 - 9.1.8)
9.12.2 Remove front housing. (Sect. 9.3.2)
9.12.3 Remove left and right rear housings. (Sect 9.3.3)
9.12.4 Remove printer enclosure shelf. (Sect 9.5.3)
9.12.5 Disconnect purple wire connector at transformer and J105 and ground from MCU.
9.12.6 Disconnect P5 from Monitor Board.
9.12.7 Remove Chassis/Monitor assembly. (Sect. 9.7.4)
9.12.8 Unscrew Ring Nut of PRB Jack with T-15145 (See Photo)



9.13 REPLACEMENT OF PRB JACK

9.13.1 Install new PRB Wire Assembly (jack and wire harness) in reverse order of disassembly.

9.14 REMOVAL OF POWER ENTRY MODULE

9.19.1 Remove Chassis/Monitor assembly per above steps 9.12.1-9.12.7.

9.19.2 Separate Housing and Base Plate:
a)Remove 4 screws from rubber feet.
b)Lift housing from base.

9.19.3 Remove wires from module.

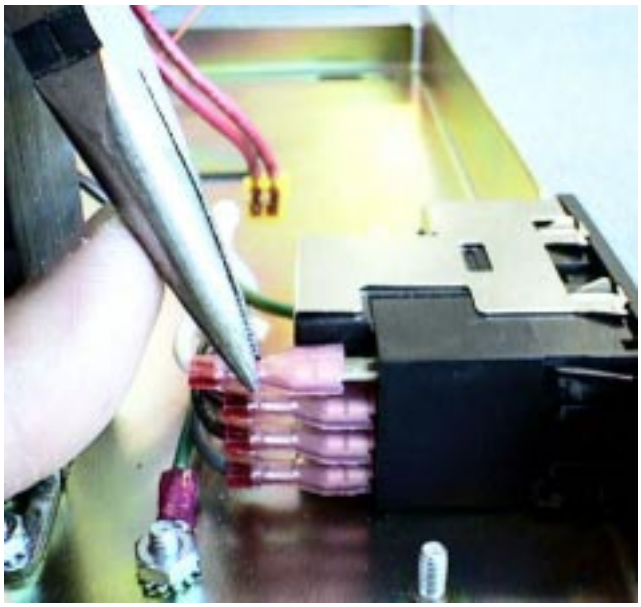
9.19.4 Slide power entry module up and out of base plate.

9.15 REPLACEMENT OF POWER ENTRY MODULE

9.15.1 Install power entry module.
a) Press power entry module into base plate assembly.

9.15.2 Restore wiring connections.
a) Refer to Sheet 2 of Drawing #112000 for correct placement of wires to power entry module.

9.15.2 Replace the housing in reverse order. (See 9.19.1- 9.19.2)



9.16 REMOVAL OF VISOR POSITION SENSOR BOARD (VPS/PCB).

9.16.1 Disassemble optics to VPS/PBC (See 9.3)

9.16.2 Remove VPS PCB
a) Disconnect front housing backplate ground. Open front shield to remove VPS connector J107 and ground terminal as shown in Section 9.7.5.
b) Remove screw . See photo at right.
c) Disconnect VPS/PCB from front housing backplate.

9.17 REPLACEMENT OF VPS PCB

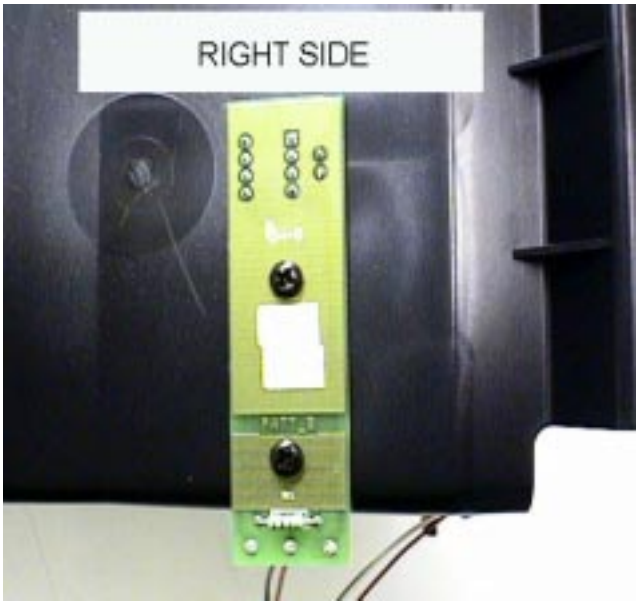
9.17.1 Install VPS PCB in reverse order.

9.18 REMOVAL OF INTERNAL PHOTODETECTOR (IP)

9.18.1 Remove front ESD shield. (follow step 9.7.1 up to and including step 9.7.5 b.

9.18.2 Unplug IP connector J110 from MCU/ PCB

9.18.3 Remove 2 screws from IP/PCB .



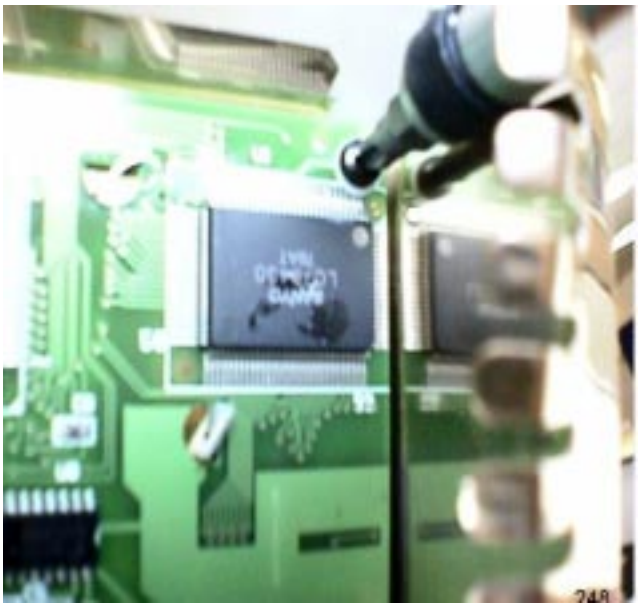
9.19 REPLACEMENT OF INTERNAL PHOTODETECTOR (IP)

9.19.1 Install IP in reverse order of removal. Make sure sensor is clean.

NOTE:If you replaced the IP with a new IP Factory Calibration is Required.

9.20 REMOVAL OF LCD MODULE/ KEYPAD

Copper ESD shields may have sharp edges. **Exercise caution to avoid cuts!**

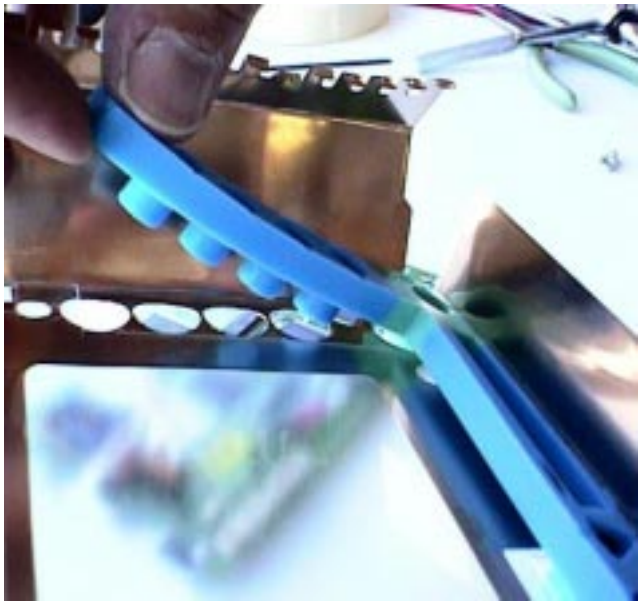


9.20.1 Remove Rear housing/LCD subassembly. Follow instructions in Sect. 9.1.1 through 9.1.6.

9.20.2 Remove LCD module.
a)Unscrew 4 screws. See photo.

9.20.2 Remove LCD module.
b)Remove 11/32” nut holding ground wire ring terminal.
c)Carefully lift shield and module together from housing.

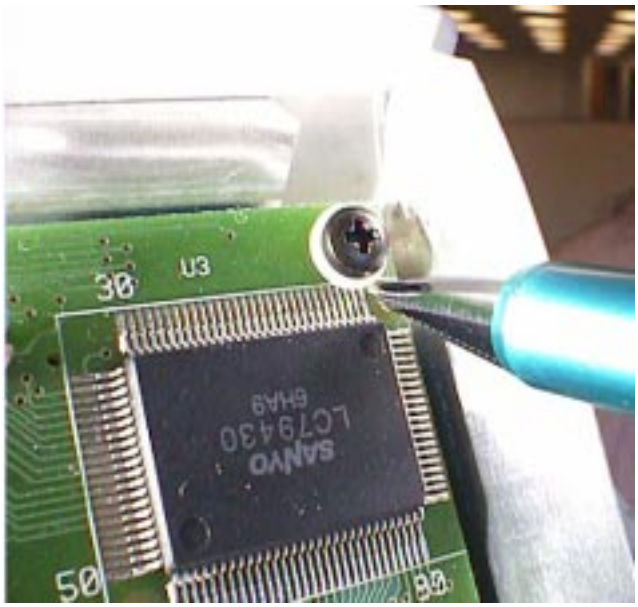
9.20.3 Remove keypad
a)Lift keypad from LCD shield.



9.21 REPLACEMENT OF LCD MODULE/ KEYPAD

9.21.1 Perform LCD module/keypad removal in reverse order.

NOTE: Install plastic insulating washer in position as shown in photo. This screw prevents shorting of adjacent component and is found in both CE and non CE units.

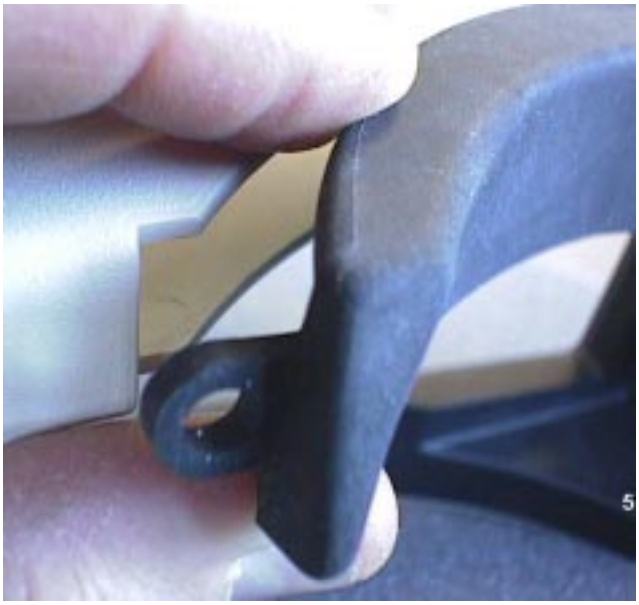


9.22 REMOVAL OF VISOR PAD

9.22.1 Remove visor/browrest sub assembly (Sect. 9.3.4)

9.22.2 Remove visor pad
a)Pull and press simultaneously in directions of arrows as shown in photo.
b)Repeat with other end of visor pad.

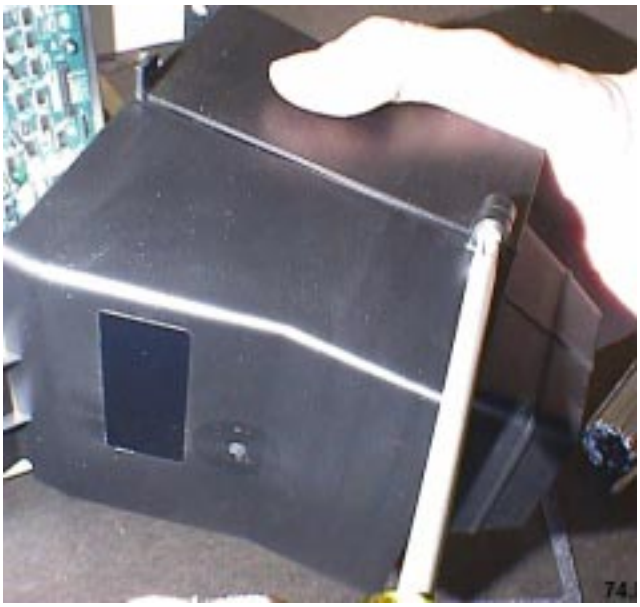
9.23 INSTALLING VISOR PAD



9.32.1 Install visor pad.
a)Place visor into visor as shown.
b)Press loops over posts on inside of visor.

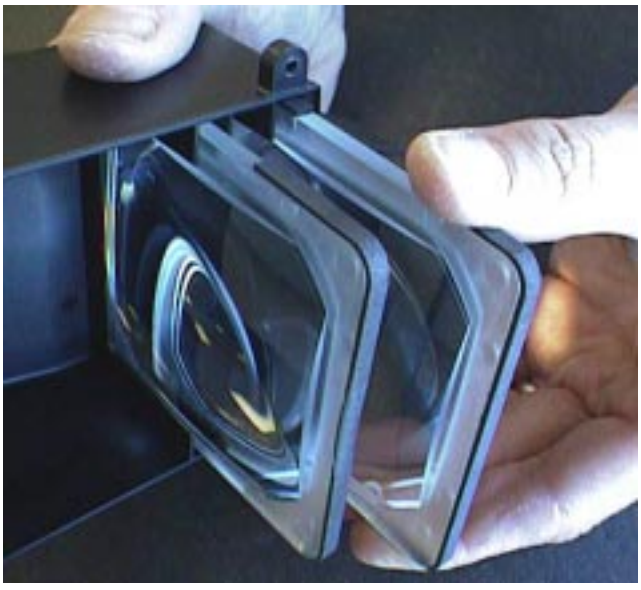
9.23.2 Replace visor/browrest sub assembly (Sect. 9.9.9)

9.24 REMOVAL OF ACRYLIC LENSES and OPTICS TUBE WINDOW



9.29.1 Remove optics tube assembly (Sect. 9.3)

9.29.2 Remove optics tube housing:
a)Remove screws that hold housings together.
b)Carefully pull one housing off.



9.29.3 Remove acrylic lenses and or optics tube window by holding edges and gently sliding them from the optics tube.

9.29.4 If lenses or optics tube window are dirty, clean with a swab and alcohol and air dry.
If a lens cannot be cleaned, install a clean replacement lens.

9.25 INSTALLING ACRYLIC LENSES and OPTICS TUBE WINDOW.

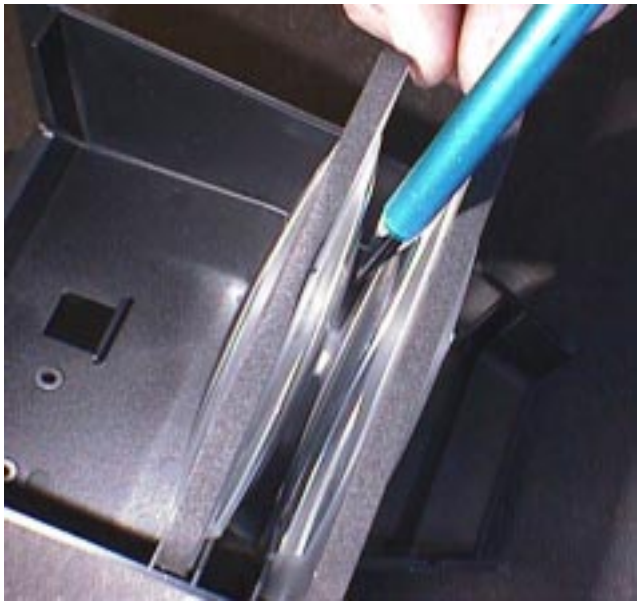
NOTE:Since replacement lenses and window may have slightly different light transmittance characteristics , it is important to perform Factory Calibration.

9.25.1 Assure that all lenses have foam tape on edges. See Drawing#112000.

9.25.2 Clean housings with air.

NOTE:SEE PHOTO AT RIGHT. Be careful to leave one space between the lenses when inserting them into the housings. If put into two adjacent grooves, they will scratch eachother when inserting the second one.

9.25.3 Put lenses and optics tube window into one optics tube.



9.25.4 Assemble housings together.
a)Slide other optics tube over lenses.
b)Replace screws.

9.25.5 Reassemble optics (Sect. 9.4)

9.25.6 If any combination of new lenses and/or optics tube window have been installed, perform factory calibration.